



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

TO THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of : Jonathan Schull
Application No.: 09/942,232
Filing Date: August 29, 2001
Group Art Unit: 3621
Title: METHOD FOR SELLING, PROTECTING,
AND REDISTRIBUTING DIGITAL GOODS
Examiner: Backer, Firmin

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**APPELLANT'S AMENDED BRIEF IN SUPPORT OF
ITS APPEAL OF FINAL REJECTION
ISSUED MAY 12, 2005
IN APPLICATION NO. 09/942,232**



TABLE OF CONTENTS

	Page
I. REAL PARTY IN INTEREST	1
II. RELATED APPEALS AND INTERFERENCES.....	1
III. STATUS OF CLAIMS	1
IV. STATUS OF AMENDMENTS	2
V. SUMMARY OF CLAIMED SUBJECT MATTER	2
VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL	5
VII. ARGUMENT	6
A. As Acknowledged By The Examiner, The Rejected Claims 8 Through 33 Satisfy The Federal Circuit's Test For Determining The <u>Existence of Statutory Subject</u> <u>Matter Under 35 U.S.C. § 101</u>	7
B. The Examiner Has Failed To Produce Any Valid Legal Authority For His Conclusion That The Claimed Invention Does <u>Not Constitute Patentable Subject</u> <u>Matter Under 35 U.S.C. §101</u>	10
(i) The methods recited in claims 8, 13, 15 and 31 are not directed to an abstract idea	10
(ii) Even if there is a requirement for claims to relate to the technological arts, the pending claims meet such a standard	13
C. A Method Claim Need Not Apply, Use Or Advance The <u>Technological Arts As</u> <u>Suggested In The Final Rejection</u>	16
VIII. CONCLUSION	19
IX. CLAIMS APPENDIX.....	19
X. EVIDENCE APPENDIX.....	20
XI. RELATED PROCEEDINGS APPENDIX	20

I. REAL PARTY IN INTEREST

The real party in interest in this Appeal is the Assignee of the present application (the "Application"), namely SL Patent Holdings LLC, which is a wholly owned subsidiary of Time Warner Inc.

II. RELATED APPEALS AND INTERFERENCES

Appellant considers the following appeals, interferences, or judicial proceedings to be related to, to directly affect or be directly affected by, or to have a bearing on the Board's decision in the pending Appeal:

1. Ex parte Lundgren, Appeal No. 2003-2088 (BPAI 2005);
2. State Street Bank & Trust Co. v. Signature Financial Group, Inc., 149 F.3d 1368, 47 U.S.P.Q.2d (BNA) 1596 (Fed. Cir. 1998);
3. In re Toma, 575 F.2d 872, 197 U.S.P.Q. (BNA) 852 (C.C.P.A. 1978);
4. Diamond v. Diehr, 450 U.S. 175 (1981);
5. In re Musgrave, 431 F.2d 882, 167 U.S.P.Q. (BNA) 280 (C.C.P.A. 1970);
6. Musco Corp. v. Qualite, Inc. 41 U.S.P.Q.2d (BNA) 1954 (Fed. Cir. 1997); and
7. AT&T Corp. v. Excel Communications, Inc., 172 F.3d 1352, 50 U.S.P.Q.2d (BNA) 1447 (Fed. Cir. 1999).

A copy of each of the above decisions is included in an Appendix of Related Proceedings attached hereto.

III. STATUS OF CLAIMS

Claims 8-33 are pending in this application. The Examiner has rejected all of these claims. Claims 8-33 are reproduced in an Appendix of Claims attached hereto. Appellant is appealing the rejection of Claims 8-33.

IV. STATUS OF AMENDMENTS

Appellant did not file any amendments subsequent to the Examiner's final rejection of the Application dated May 11, 2005, which was mailed on May 12, 2005.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The following is a summary of the claimed subject matter with respect this Appeal, in accordance with 37 C.F.R. § 41.37(c)(v):

Independent claim 8 recites a method for limiting access to selected features of a multimedia file. The method of claim 8 comprises the steps of: disabling selected features of said multimedia file (*see, e.g.,* page 5, lines 13-26; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1), distributing said multimedia file with at least some enabled features (*see, e.g., Id.*) and offering to enable one or more specific disabled features when a user attempts to use at least one of said specific disabled features (*see, e.g., Id.*). The method of claim 8 further comprises receiving a request for a user or user's system, said request identifying an operating context and identifying said one or more disabled features (*see, e.g.,* page 7, line 17 – page 8, line 5; page 10, lines 9 – 27; page 11, line 23 – page 13, line 5; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1); and transmitting an authorization to said user or user's system to enable said one or more disabled features, where said authorization is uniquely associated with said operating context (*see, e.g.,* page 8, lines 14-26; page 10, lines 9-27; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1); whereby said selected features remain enabled only for said operating context (*see, e.g., Id.*).

Independent claim 13 recites a method for limiting access to selected features of a data object. The method of claim 13 comprises the steps of: compressing or encrypting portions of said data object (*see, e.g.,* page 19, lines 11-14; page 24, lines 4-19; page 25, line 22 – page 26,

line 7; Fig. 1); distributing said data object with at least some operable features (*see*, e.g., page 5, lines 13-26; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1); and offering to decompress or decrypt one or more portions of said data object when a user of one of said operable features attempts to use features of at least one of said compressed or encrypted portions (*see*, e.g., page 5, lines 13-26; page 18, line 20 – page 19, line 27; page 24, lines 4-19; page 25, line 22 – page 26, line 7; Fig. 1). The method of claim 13 further comprises receiving a request from a user or user's system, said request identifying an operating context and said one or more compressed or encrypted portions (*see*, e.g., page 7, line 17 – page 8, line 5; page 10, lines 9 – 27; page 11, line 23 – page 13, line 5; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1); and transmitting an authorization to said user or user's system to decompress or decrypt at least one compressed or encrypted portion, where said authorization is uniquely associated with said unique user (*see*, e.g., page 8, lines 14-26; page 10, lines 9-27; page 18, line 20 – page 19, line 27; page 24, lines 4-19; page 25, line 22 – page 26, line 7; Fig. 1); whereby said selected portion is decompressed or decrypted only for said identified operating context (*see*, e.g., *Id.*).

Independent claim 15 recites a method for limiting access to selected data features of copyable encoded information accessed by a user on a user's system, and for restricting access to said selected data features to a particular operating context. The method of claim 15 comprises the steps of locking said selected data feature, having a feature identifier, with an corresponding key (*see*, e.g., page 5, lines 13-26; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1); receiving an unlock request, from the user or user's system, said request having a operating context identifier and a feature identifier (*see*, e.g., page 7, line 17 – page 8, line 5; page 10, lines 9 – 27; page 11, line 23 – page 13, line 5; page 18, line 20 – page 19, line 27; page 22, line 12 –

page 23, line 8; page 24, lines 4-19; page 25, lines 1-14; Figs. 1 and 2); and transforming said key using at least said unique operating context identifier to form an authorization (*see, e.g.,* page 8, lines 14-26; page 10, lines 9-27; page 13, lines 11-19; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1). The method of claim 15 further comprises transmitting said authorization to said user or user's system (*see, e.g.,* page 8, lines 14-26; page 10, lines 9-27; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1); reverse transforming said authorization using said unique operating context identifier to obtain the key corresponding to said feature identifier (*see, e.g.,* page 18, line 20 – page 19, line 27; page 24, lines 4-19; page 25, lines 15-21; Fig. 1); and using said key to temporarily unlock said selected data feature (*see, e.g.,* page 8, lines 14-26; page 10, lines 9-27; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1); whereby said authorization can only be used to access the selected data feature in the presence of said operating context identifier (*see, e.g.,* page 8, lines 14-26; page 10, lines 9-27; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1).

Independent claim 31 recites a method for sharing limited access to selected data features of copyable encoded information stored on a server, and for permitting only uniquely identified workstations to unlock said selected data features. The method of claim 31 comprises the steps of locking said selected data feature, having a feature-identifier, with a corresponding key (*see, e.g.,* page 5, lines 13-26; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1); receiving an unlock request having a unique workstation-identifier and a feature identifier from the workstation (*see, e.g.,* page 7, line 17 – page 8, line 5; page 10, lines 9 – 27; page 11, line 23 – page 13, line 5; page 18, line 20 – page 19, line 27; page 22, line 12 – page 23, line 8; page 24, lines 4-19; page 25, lines 1-14; Figs. 1 and 2); and transforming said key using at least said unique workstation identifier to form an authorization (*see, e.g.,* page 8, lines 14-26; page 10,

lines 9-27; page 13, lines 11-19; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1).

The method of claim 31 further comprises transmitting said authorization to said workstation (*see, e.g.,* page 8, lines 14-26; page 10, lines 9-27; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1); reverse transforming said authorization using said unique workstation identifier to obtain the key corresponding to said feature-identifier (*see, e.g.,* page 18, line 20 – page 19, line 27; page 24, lines 4-19; page 25, lines 15-21; Fig. 1); and using said key to unlock said selected data feature (*see, e.g.,* page 8, lines 14-26; page 10, lines 9-27; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1); whereby said key can only be used to access the selected data feature from a unique workstation-identifier (*see, e.g.,* page 8, lines 14-26; page 10, lines 9-27; page 18, line 20 – page 19, line 27; page 24, lines 4-19; Fig. 1).

To the extent that any of the claims recite step-plus-function limitations, at least some of the applicable acts from the specification and drawings are referenced above.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The issues for review in this Appeal arise from a Final Rejection of the Application that was mailed on May 12, 2005 (the “Final Rejection”).

In the Final Rejection, the Examiner rejected claims 8 through 33 of the Application under 35 U.S.C. § 101 based on a conclusion that the claimed invention is directed to non-statutory subject matter. The Examiner indicated that the basis for the Section 101 rejection was a “two prong test” of: “(1) whether the invention is within the technological arts; and (2) whether the invention produces a useful, concrete and tangible result.” (*Final Rejection* at 2)

In light of the foregoing, the issues in this Appeal are as follows:

Issue No. 1: Did the Examiner err in applying the above-referenced two-pronged analysis to determine that the methods described in claims 8 through 33 constitutes non-statutory subject matter under 35 U.S.C. § 101?

Issue No. 2: Do the recitations of the following claims qualify as statutory subject matter under 35 U.S.C. §101?

- a. claims 8-12;
- b. claims 13-14;
- c. claims 15-30; and
- d. claims 31-33.

As set forth in detail below, the answer to both these questions is a resounding “yes”, and therefore the Final Rejection should be reversed in all respects.

VII. ARGUMENT

The Board should reverse the Examiner’s rejection because, as discussed further below, it is based on an erroneous and unsupportable reading of the applicable legal standard. Instead of following the Federal Circuit’s explicit and undisputed guidance for determining whether an invention is directed to statutory subject matter under 35 U.S.C. § 101, the Examiner made up his own test and then, in explaining his rationale for applying that test, mixed and matched pieces of additional tests which have been clearly repudiated by the Federal Circuit – in some cases more than 25 years ago. Additionally, it should be noted that the Board has expressly rejected the Examiner’s test as noted below. Because the Examiner’s rejections are expressly based on these extra-judicial tests rather than on the Federal Circuit and the Board’s leading decisions in the area, the Examiner’s rejections must not be allowed to stand. Indeed, anything other than a complete reversal of the Examiner’s rejections will result in the Appellant being unfairly and

unlawfully deprived of its patent rights in connection with the claimed invention, in violation of 35 U.S.C. § 1 *et seq.* Accordingly, the Board should reverse the Examiner's Final Rejection in all respects.

A. As Acknowledged By The Examiner, The Rejected Claims 8 Through 33 Satisfy The Federal Circuit's Test For Determining The Existence of Statutory Subject Matter Under 35 U.S.C. § 101

There is no dispute that claims 8 through 33 satisfy the only applicable test enunciated by the Federal Circuit for determining whether a claimed invention is directed to statutory subject matter. As the Examiner himself acknowledged in the Final Rejection (*Final Rejection* at 3) the claims in question comport with the Federal Circuit's standard for determining the existence of statutory subject matter under 35 U.S.C. § 101 – namely, that the claimed invention “produces a ‘useful, concrete and tangible result.’” *State Street Bank & Trust v. Signature Financial Group*, 149 F.3d 1368, 1373, 47 U.S.P.Q.2d (BNA) 1596, 1602 (Fed. Cir. 1998) (the invention in question produced a “useful, concrete and tangible result” that “renders it statutory subject matter”). In the Final Rejection, the Examiner acknowledged that the recited method produces a useful, concrete and tangible result, but nonetheless issued the Final Rejection based on the stated conclusion that “[t]he recited steps do not apply, involve, use or advance the technological arts since all the steps can be performed in the mind of the user or by use of pencil and paper and no specific technology (e.g. computer, processor) is expressly recited in the body of the claims.” (*Final Rejection* at 2-3) (citing *In re Toma*, 575 F.2d. 872, 197 U.S.P.Q. (BNA) 852 (C.C.P.A. 1978)). Thus, continued the Examiner, “[a]lthough the recited method produces useful, concrete and tangible result[s], since the claimed invention, as a whole, it [sic] not within the technological arts as explained above, [independent] claims 8, 13, 15 and 31 seemed [sic] to be directed to non-statutory subject matter.” (*Final Rejection* at 3).

The Examiner summed up his justification for the final rejection as follows: “Claims 8-33 are rejected under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter. The basis of this rejection is set forth in a two prong [sic] test of: (1) whether the invention is within the technological arts; and (2) whether the invention produces a useful, concrete and tangible result.” (*Final Rejection* at 2) The grievous error in this rationale lies in the first prong of the Examiner’s test. If, as discussed above, the second prong of the test is sufficient for the Federal Circuit, then what could possibly have been the basis for the Examiner’s imposition of the additional hurdles of the first prong? The Examiner further provides no guidance as to what “technological arts” means nor how to apply such a test to a particular scenario except to say: “The recited steps do not apply, involve, use or advance the technological arts since all the steps can be performed in the mind of the user or by use of pencil and paper and no specific technology (e.g. computer processor) is expressly recited in the body of the claims.” (*Final Rejection* at 2-3) (citation omitted).

The Examiner would have the reader believe that the answer to these puzzling questions lie in *In re Toma*, 575 F.2d 872, 197 U.S.P.Q. (BNA) 852 (C.C.P.A. 1978). However, a reading of *Toma* quickly reveals that the Examiner’s reliance on that case to justify the imposition of the “technological arts” prong of his “test” is entirely off the mark. *Toma* involved an appeal in the United States Court of Customs and Patent Appeals of a decision of the Patent and Trademark Office Board of Appeals rejecting certain claims of the inventor’s application for “Method Using a Programmed Digital Computer System for Translation Between Natural Languages” under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

The *Toma* court noted that the examiner, in his final rejection, appeared to have rejected the claims because a computerized method of translation was not, according to the examiner, “in

the ‘technological arts.’” *Toma*, 575 F.2d at 877, 197 U.S.P.Q. (BNA) at 857. The court went on to observe that “the method for enabling a computer to translate natural languages *is* in the technological arts, i.e., it is a method of operating a machine.” *Id.* (emphasis added)

The court discussed that the examiner had misapplied the term “technological arts” -- the cases that the examiner in *Toma* had cited all involved situations in which there had been “mental steps” rejections. *Toma*, 575 F.2d at 877-78, 197 U.S.P.Q. at 857. In this regard, the court stated: “The language which the examiner has quoted was written in answer to “mental steps” rejections and was not intended to create a generalized definition of statutory subject matter. Moreover, it was not intended to form a basis for a new § 101 rejection as the examiner apparently suggests. To the extent that this ‘technological arts’ rejection is before us, independent of the rejection based on Benson, it is also reversed.” *Toma*, 575 F.2d at 878, 197 U.S.P.Q. (BNA) at 857.

Thus, the *Toma* decision has little relevance to, and provides no support for, the Examiner’s “technological arts” requirement imposed here. The limited language in *Toma* referencing “technological arts” clearly indicated that such a requirement was not applicable to the facts in *Toma*. Moreover, there is simply no definition of “technological arts” in *Toma* and certainly no connection to “mind of the user”, “use of pencil and paper” or recitation of specific technology – as is argued by the Examiner. In any event, to the extent that there was any analysis based on “technological arts” over twenty-five (25) years ago in 1978 when *Toma* was decided, such a requirement has been effectively overturned by *State Street*.

It should also be noted that the Board, itself, has recently rejected the “technological arts” test in *Ex parte Lundgren*, Appeal No. 2003-2088 (BPAI 2005), *holding*:

[o]ur determination is that there is currently no judicially recognized separate “technological arts” test to determine patent eligible subject matter under § 101. We decline to create one.

Appellant respectfully submit that the facts of this Appeal do not merit the Board’s revisiting or reversing its current position. Appellant respectfully request the Board to reverse the Examiner’s decision regarding the above rejections.

B. The Examiner Has Failed To Produce Any Valid Legal Authority For His Conclusion That The Claimed Invention Does Not Constitute Patentable Subject Matter Under 35 U.S.C. §101

The only explanation that the Examiner provides for his contention that the claimed methods to not constitute statutory matter under 35 U.S.C. § 101 is that “the inventive concept in claims 8, 13, 15 and 31 only recites an abstract idea” and that the recited steps “do not involve, use or advance the technological arts since all the steps can be performed in the mind of the user or by use of a pencil and paper and no specific technology (e.g. computer processor) is expressly recited in the body of the claims.” (*Final Rejection* at 2-3) (citing *Toma*) As discussed further below, there is no support in the law or the facts for the Examiner’s foregoing conclusions and his Final Rejection must therefore be overturned.¹

(i) The methods recited in claims 8, 13, 15 and 31 are not directed to an abstract idea

The Examiner admits he “has the burden to establish a prima facie case that the claimed invention as a whole is directed to solely an abstract idea or to manipulation of abstract [ideas] or

¹ The Examiner’s unsupported insinuation that the Appellant is aware of the legal authority for his point but has chosen to ignore it doesn’t relieve the Examiner of his obligation to clearly set out the legal authority for his Section 101 rejection. (“[i]t is clear that the Applicant is aware of the law but is not in compliance with the law, that is claims 8, 13, 15 and 31 deem to be directed to non-statutory subject matter”). (*Final Rejection* at 4) The Examiner’s contention that the supporting law for the Final Rejection is so clear that he need not recite it, or that the Appellant can be made to guess as to the legal authority that the Examiner has in mind, is merely camouflage for the fact that the law does not support the Final Rejection. On these grounds alone, the Final Rejection should be overruled.

does not produce a useful result.” (*Final Rejection* at 3) Yet the Examiner does not even attempt to make any type of showing that the claims in question are directed solely to an abstract idea. Instead, the Examiner baldly states his contention that the “inventive concept” in claims 8, 13, 15 and 31 “only recites an abstract idea.” (*Id.*) In support for this premise, the Examiner offers merely the perfunctory statement that “[t]he recited steps do not apply, involve, use or advance the technological arts since all steps can be performed in the mind of the user or by use of a pencil and paper and no specific technology (e.g. computer, processor) is expressly recited in the body of the claims.” (*Id.* at 2-3) (citing *Toma*).

There is no support, and the Examiner has offered none, for the Examiner’s contention that the claims in question fall into the “abstract idea” exception to 35 U.S.C. § 101, as described in *Diamond v. Diehr*, 450 U.S. 175 (1981). In the first place, the Examiner has expressly acknowledged in the Final Rejection that “the recited method produces a useful, concrete and tangible result.” (*Final Rejection* at 3) The Examiner makes no attempt in the Final Rejection to explain how, in his view, a method could both produce a useful, concrete and tangible result, while at the same time being a mere abstract idea.

When courts discuss the concept of an abstract idea as related to non-patentable subject matter, the following types of phrases are employed: “A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right.” *Diehr*, 450 U.S. at 185 (citation omitted). Abstract ideas become patentable subject matter when “reduced to some type of practical application, i.e., a useful concrete and tangible result.” *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368, 1373, 47 U.S.P.Q.2d (BNA) 1596, 1600-01 (Fed. Cir. 1998) (quotations omitted). Abstract ideas are “disembodied concepts or truths that are not useful.”

State Street, 149 F.3d at 1373, 47 U.S.P.Q.2d (BNA) at 1601 (quotations omitted). As discussed below, none of pending independent claims 8, 13, 15 or 31 even arguably corresponds to such theoretical principles.

a) **The recitations of independent claim 8 do not merely relate to an abstract idea**

Claim 8 recites a method for limiting access to selected features of a multimedia file. Particular steps or acts are set forth which indicate how this method is to be performed. The utility of such a method is clearly evident and is discussed at length throughout the specification. Dependent claims 9-12 include the above-referenced limitations of claim 8 and similarly do not recite an abstract idea.

b) **The recitations of independent claim 13 do not merely relate to an abstract idea**

Claim 13 recites a method for limiting access to selected features of a data object. Particular steps or acts are set forth which indicate how this method is to be performed. The utility of such a method is clearly evident and is discussed at length throughout the specification. Dependent claim 14 includes the above-referenced limitations of independent claim 13 and similarly does not recite an abstract idea.

c) **The recitations of independent claim 15 do not merely relate to an abstract idea**

Claim 13 recites a method for limiting access to selected data features of copyable encoded information accessed by a user on a user's system, and for restricting access to said selected data features to a particular operating context. Particular steps or acts are set forth which indicate how this method is to be performed. The utility of such a method is clearly evident and is discussed at length throughout the specification. Dependent claims 14-30 include the above-referenced limitations of independent claim 13 and similarly do not recite an abstract idea.

d) **The Recitations of independent claim 31 do not relate to an abstract idea**

Independent claim 31 recites a method for sharing limited access to selected data features of copyable encoded information stored on a server, and for permitting only uniquely identified workstations to unlock said selected data features. Particular steps or acts are set forth which indicate how this method is to be performed. The utility of such a method is clearly evident and is discussed at length throughout the specification. Dependent claims 32-33 include the above-referenced limitations of independent claim 31 and similarly do not recite an abstract idea.

Accordingly, since the Final Rejection was expressly based, at least in part, on the Examiner's erroneously labeling of the claimed invention as an abstract idea, and since the Examiner admits the invention provides a useful, concrete and tangible result which, by definition, means the invention does not relate to merely an abstract idea, the Final Rejection must be overturned.

(ii) **Even if there is a requirement for claims to relate to the technological arts, the pending claims meet such a standard**

As discussed above, the Examiner's so-called "technological arts" test is not relevant to the question of whether claims 8 through 33 are directed to statutory subject matter under 35 U.S.C. § 101. However, assuming for the sake of argument that the applicable test did include some type of "technological arts" requirement as described in the Final Rejection, clearly independent claims 8, 13, 15 and 31, as well as the respective dependent claims associated therewith, would pass such a test.

The Examiner provides no guidance as to what "technological arts" means nor how to apply it in a particular situation except to state: "[t]he recited steps do not apply, involve, use or advance the technological arts since all the steps can be performed in the 1) mind of the user or by use of pencil and paper and 2) no specific technology (e.g. computer, processor) is expressly

recited in the body of the claims.” (*Final Rejection* at 3) (citing *In re Toma*, 575 F.2d 872, 197 U.S.P.Q. (BNA) 852 (C.C.P.A. 1978)) (emphasis and enumeration added). The Examiner appears to set forth a two-part test for “technological arts” yet each part of that test has clearly been repudiated as a requirement by the Federal Circuit.

The recitations of claim elements may be performed in the mind of a user without invalidating that claim as non-statutory subject matter; similarly, simply because a claim element can be performed by pencil and paper in conjunction with a user’s mind does not mean the claim cannot qualify as statutory subject matter. It is simply incorrect to state that claims “are directed to non-statutory processes merely because some or all the steps therein can also be carried out in or with the aid of the human mind or because it may be necessary for one performing the processes to think.” *In re Musgrave*, 431 F.2d 882, 893, 167 U.S.P.Q. (BNA) 280, 289 (C.C.P.A. 1970). See, also, *Musco Corp. v. Qualite, Inc.* 41 U.S.P.Q.2d (BNA) 1954, 1956 (Fed. Cir. 1997) (stating “[t]he existence of mental steps in the claims or specifications of a patent do not, in and of themselves, invalidate the patent”).

Process claims such as those described in the instant application need not recite specific technology to satisfy the requirements of 35 U.S.C. §101 – as is suggested in the Final Rejection. *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368, 1373-74, 47 U.S.P.Q.2d (BNA) 1596, 1602 (Fed. Cir. 1998). One can only surmise that the Examiner’s attempted imposition of such a structural or technical requirement may well stem from the now-defunct *Freeman-Walter-Abele* test. *State Street*, 149 F.3d at 1374, 47 U.S.P.Q.2d (BNA) at 1601. However, this test, in light of recent court rulings, has little or no applicability, which raises the question of whether such test was or was not the basis of the Examiner’s Final Rejection. *Id.*

Without a definition of “technological arts” or any legal authority to consult, Appellant is placed in the unreasonable position of having to conjecture on the Examiner’s position. Moreover, the only legal authority cited by the Examiner, *Toma*, provides simply the following guidance – “[the recited claim] is in the technological arts, i.e., it is a method of operating a machine.” *In re Toma*, 575 F.2d 872, 878, 197 U.S.P.Q. (BNA) 852, 857 (C.C.P.A. 1978).

a) **The recitations of claim 8 relate to technology**

Independent claim 8 includes "a multimedia file", "disabling selected features of said multimedia file", "receiving a request from a user or user's system, said request identifying an operating context", "transmitting an authorization to said user or user's system to enable said one or more disabled features", etc. Dependent claims 9-12 include the recitations of claim 8. Whatever “technological arts” means, it certainly includes such recitations.

b) **The recitations of claim 13 relate to technology**

Claim 13 includes "a data object", "compressing or encrypting portions of said data object", "offering to decompress or decrypt one or more portions of said data object", "receiving a request from a user or user's system, said request identifying an operating context", "transmitting an authorization to said user or user's system to decompress or decrypt", etc. Dependent claim 14 includes the recitations of claim 13. Whatever “technological arts” means, it certainly includes such recitations.

c) **The recitations of claim 15 relate to technology**

Claim 15 includes "limiting access to selected data features of copyable encoded information accessed by a user on a user's system", "locking said selected data feature", "transforming said key", "transmitting said authorization", "reverse transforming said

authorization", "said authorization can only be used to access the selected data feature in the presence of said operating context identifier", etc. Dependent claims 16-30 include the recitations of claim 15. Whatever "technological arts" means, it certainly includes such recitations.

d) **The recitations of claim 31 relate to technology**

Claim 31 includes "encoded information stored on a server", "permitting only uniquely identified workstations to unlock said selected data features", "receiving an unlock request having a unique workstation-identifier and a feature identifier from the workstation", "transforming said key", "transmitting said authorization", "reverse transforming said authorization", etc. Dependent claims 32-33 include the recitations of claim 31. Whatever "technological arts" means, it certainly includes such recitations.

Appellant notes that the Examiner does not even attempt to provide reasonably detailed explanations as to why, in his view, *none* of the subject claims (i.e. 8-33), portions of which are recited above, come within the "technological arts" umbrella. The reality is that there are no valid explanations for his conclusion -- if they did exist, the Examiner surely would have mentioned them in the Final Rejection.

C. **A Method Claim Need Not Apply, Use Or Advance The Technological Arts As Suggested In The Final Rejection**

The Final Rejection is expressly based, at least in part, on the Examiner's conclusion that "for a method claim to pass muster, the recited method must somehow apply, use or advance the technological arts," (*Final Rejection* at 2) (emphasis added). However, as discussed above, aside from erroneously citing to *Toma*, the Examiner does not provide *any* legal authority for this conclusion. In fact, the Examiner could not do so since the courts have been very clear that method claims are not to be held to a standard under 35 U.S.C. § 101 that is

different from the standards applied to any other types of patentable subject matter. *State Street*, F.3d at 1375, 47 U.S.P.Q.2d (BNA) at 1602 (“[s]ince the 1952 Patent Act, business methods have been, and should have been, subject to the same legal requirements for patentability as applied to any other process or method”). Put another way, in the words of the Federal Circuit, “[w]hether stated implicitly or explicitly, we consider the scope of § 101 to be the same regardless of the form – machine or process – in which a particular claim is drafted.” *AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352, 1357-58, 50 U.S.P.Q.2d (BNA) 1447, 1451 (Fed. Cir. 1999). In *Ex parte Lundgren*, the Board referred to both *State Street* and *AT&T* when it expressly rejected the technological test. Appeal No. 2003-2088 (BPAI 2005), *holding* “[o]ur determination is that there is currently no judicially recognized separate ‘technological arts’ test to determine patent eligible subject matter under § 101.”

In *AT&T*, the relevant patent dealt with facilitating billing techniques for long-distance telephone carriers. The patent disclosed adding a PIC (primary interexchange carrier) indicator into a data field of a standard message record. *AT&T*, 172 F.3d at 1353, 50 U.S.P.Q.2d (BNA) at 1448. A subscriber could be billed differently depending upon whether the subscriber called someone with the same or different long-distance carrier based on the PIC indicator. *AT&T*, 172 F.3d at 1353-54, 50 U.S.P.Q.2d (BNA) at 1448-49. The claim in question recited, in part,

generating a message record for an interexchange call between an originating subscriber and a terminating subscriber, and including, in said message record, a primary interexchange carrier (PIC) indicator having a value which is a function of whether or not the interexchange carrier associated with said terminating subscriber is a predetermined one of said interexchange carriers.

AT&T, 172 F.3d at 1354, 50 U.S.P.Q.2d (BNA) at 1449 (emphasis in original). The Federal Circuit stated that although the determination of the PIC indicator value was derived using a

simple Boolean mathematical formula (i.e. p and q), the claim did not attempt to protect this Boolean principle nor attempt to forestall its use in other applications. *AT&T*, 172 F.3d at 1358, 50 U.S.P.Q.2d (BNA) at 1452. As the PIC indicator represented information about a call recipient's PIC, it was a useful, non-abstract result of the claimed process. *Id.* Thus, since the claim produced a useful, concrete and tangible result and did not preempt a mathematical principle, the claimed process presented statutory subject matter. *Id.* Significantly, once the Federal Circuit in *AT&T* determined that the claimed methodologies produced a useful, concrete and tangible result, it did not then go on to apply the Examiner's "technological arts" test – instead, it declared the claims to embody statutory subject matter under 35 U.S.C. § 101. In the instant Appeal, Appellant asks only that the Board adopt such an approach and recognize that the flaws in the Final Rejection arising from the Examiner's use of his "two-pronged" analysis require that the decision be reversed in all respects.

Just like in *AT&T*, the claimed methods in the instant matter produce a useful, concrete and tangible result and do not preempt a mathematical principle. In independent claim 8 and dependent claims 9 through 12, for example, selected features in a multimedia file are enabled only for an identified operating context. In another example, independent claim 13 and dependent claim 14, a selected portion of a data object is decompressed or decrypted only for an identified operating context. Further, in independent claim 15 and dependent claims 16 through 30, authorization to access a selected data feature can only be used in the presence of an operating context identifier. Finally, independent claim 31 and dependent claims 32 and 33 address a key used to access a selected data feature that can only be used from a unique workstation-identifier. Such claims hardly comprise an abstract idea.

Accordingly, as in *State Street*, and later in *AT&T* and *Ex parte Lundgren*, the very essence of the claimed invention is to produce a useful, concrete and tangible result, and there can be no doubt that the methods described in claims 8 through 33 do so. Certainly, simply because the invention may make use of software and other information technology does not mean that the results produced are any less useful, concrete or tangible, or for that matter, any less worthy of receiving a patent. Nor does the “technological arts” test that the Examiner proposes undercut or detract from the useful, concrete and tangible results that the claimed invention produces. As discussed above, since the production of such results is the only relevant test after the *State Street* decision for determining the existence of statutory subject matter under 35 U.S.C. § 101, and since even the Examiner acknowledges that the claimed invention satisfies that test, there can be no dispute that claims 8 through 33 constitute statutory subject matter under 35 U.S.C. § 101. Therefore, Appellant respectfully requests that the Final Rejection, which disallowed those claims in their entirety, be reversed in all respects.

VIII. CONCLUSION

In view of the foregoing, Appellant respectfully requests that the Board reverse the rejections of claims 8 through 33 as set forth in the Office Action mailed on May 12, 2005, that the Board allow the pending claims since they are in condition for allowance, and that the Board grant Appellant such other and further relief that the Board deems just and proper.

IX. CLAIMS APPENDIX

An Appendix of Claims containing a copy of the claims that are the subject of this Appeal is attached hereto.

X. EVIDENCE APPENDIX

Appellant respectfully submits that no additional evidence is being submitted under 37 C.F.R. § 41.37(c)(ix). Excepted as noted in the Appendix of Related Proceedings (attached hereto), there is no additional evidence to be submitted pursuant to §§ 1.130, 1.131, or 1.132 of 37 C.F.R., nor is there any other evidence entered by the examiner and relied upon by Appellant in this Appeal.

XI. RELATED PROCEEDINGS APPENDIX

An Appendix of Related Proceedings containing a copy of court or Board decisions that are the subject of this Appeal is attached hereto.

Date: March 31, 2006

Respectfully submitted,



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APPENDIX OF CLAIMS

8. A method for limiting access to selected features of a multimedia file, comprising the steps of

disabling selected features of said multimedia file;

distributing said multimedia file with at least some enabled features;

offering to enable one or more specific disabled features when a user attempts to use at least one of said specific disabled features;

receiving a request from a user or user's system, said request identifying an operating context and identifying said one or more disabled features; and

transmitting an authorization to said user or user's system to enable said one or more disabled features, where said authorization is uniquely associated with said operating context;

whereby said selected features remain enabled only for said operating context.

9. The method of claim 8 further comprising the step of:

identifying an operating context and a licensor from information in said request and arranging to send an authorization according to an agreement between said user and said licensor.

10. The method of claim 8 further comprising the steps of:

providing a user environment in which pre-defined actions by said user are interpreted as a request for access to at least some of said disabled features;

creating an identifier for said operating context, wherein said identifier is created according to at least one measurable factor of said user's user environment; and

using said operating context identifier to associate said authorization with said user's operating context;

whereby said authorization will not enable said disabled features when said at least one measurable factor has changed beyond a pre-configured limit.

11. The method of claim 8 in which said at least one measurable factor is selected from the set of:

machine-readable user identifier serial number of user processor or product, machine-readable features of the user's system, user's voice pattern, spoken or typed password, processor time-stamp, nearly unique tattoo, telephone number, network address, user's visual appearance, and biological tissue samples

12. The method of claim 8 further comprising the steps of:
ensuring that an authorization received for one or more selected features for said unique user cannot be used for access by another user or on another system; and

permitting use of said at least some enabled features in a different operating context; whereby users can obtain authorization to test or demonstrate said selected features on one system and provide additional copies of the multimedia file to others who must then request their own authorizations.

13. A method for limiting access to selected features of a data object, comprising the steps of:

compressing or encrypting portions of said data object;

distributing said data object with at least some operable features;

offering to decompress or decrypt one or more portions of said data object when a user of one of said operable features attempts to use features of at least one of said compressed or encrypted portions;

receiving a request from a user or user's system, said request identifying an operating context and said one or more compressed or encrypted portions;

transmitting an authorization to said user or user's system to decompress or decrypt at least one compressed or encrypted portion, where said authorization is uniquely associated with said unique user;

whereby said selected portion is decompressed or decrypted only for said identified operating context.

14. The method of claim 13 further comprising the steps of:

providing a user environment in which pre-defined actions by said user are interpreted as a request for access to at least some of said compressed or encrypted features;

creating a unique identifier for identifying said operating context according to at least one measurable factor of said user's user environment; and

using said unique identifier to associate said authorization with said user's user environment;

whereby said authorization will not enable decompression or decryption of said compressed or encrypted portion when said at least one measurable factor has changed beyond a pre-configured limit.

15. A method for limiting access to selected data features of copyable encoded information accessed by a user on a user's system, and for restricting access to said selected data features to a particular operating context, comprising the steps of:

locking said selected data feature, having a feature identifier, with a corresponding key;

receiving an unlock request, from the user or user's system, said request having a operating context identifier and a feature identifier;

transforming said key using at least said unique operating context identifier to form an authorization;

transmitting said authorization to said user or user's system;

reverse transforming said authorization using said unique operating context identifier to obtain the key corresponding to said feature identifier; and

using said key to temporarily unlock said selected data feature;

whereby said authorization can only be used to access the selected data feature in the presence of said operating context identifier.

16. The method of claim 15 in which said operating context identifier is generated according to a pre-determined combination of values selected from the set of: measurable parameters of a user's system, measurable physical information about the user, and information supplied by the user.

17. The method of claim 15 in which said operating context identifier is generated for each unlock request according to the present state of a pre-determined combination of values collected by a user's system.

18. The method of claim 15 in which said feature identifier is generated using unique identification information about said selected data feature in combination with said context identifier.

19. The method of claim 15 in which said transforming step uses encryption.

20. The method of claim 15 further comprising the steps of:
retrieving an authorization that has been previously stored for said selected data feature;
reverse transforming said retrieved authorization to obtain a valid key; and
unlocking said feature with said valid key;
whereby a selected data feature once unlocked remains unlockable in the presence of said previously stored authorization and said operating context under pre-determined conditions.

21. The method of claim 15 further comprising the steps of:
storing at least some of said authorizations received by said user or user's system;
selecting a candidate authorization previously stored for said selected data feature;
validating said selected candidate authorization with a reverse transform using said unique operating context identifier; and
either unlocking said selected data feature, if said selected candidate authorization is successfully validated, or else signaling the user or user's system to obtain a valid authorization.

22. The method of claim 15 wherein:
said transforming step is based upon a prime factorization of an N-digit number using said operating context identifier as a randomization key, where N is chosen to be within the factorization capabilities of a licensing computer but beyond the capabilities of the user or the user's system, and

said reverse transforming step comprises generating the N-digit number in said user's system, and confirming that said N-digit number is the product of the factorization contained in said authorization.

23. The method of claim 15 in which

said transforming step is based upon use of the operating context identifier as the seed for a complex pseudo-random number generator, and said reverse transforming step confirms that the authorization generated in the user's system corresponds to the authorization received, based upon a transform of the operating context identifier and feature identifier.

24. The method of claim 15 further comprising the step of:

storing at least some of said authorizations received by said user or user's system;
determining whether a valid authorization is stored corresponding to a selected data feature desired by said user using said operating context identifier, and
advertising information to said user regarding purchase of a new authorization for said selected data feature when said user's system determines that a corresponding authorization has not been stored or cannot be validated in the present operating context.

25. The method of claim 24 in which said advertising information includes information selected from the set of: description of the selected data feature, advantages of the selected data feature, cost or other requirements for access to the selected data feature, source identification for obtaining an authorization, identification of an owner or licensor of rights in the selected data feature, and method of obtaining a valid authorization for access to said selected data feature.

26. The method of claim 15 further comprising the steps of:

permitting a user or user's system to operate or access at least some unprotected features of said encoded information;

assisting said user in selection of a selected data feature by disclosing information to said user regarding data features for which no valid authorization is present; and

connecting said user's system to a licensing processor for transmission of said unlock request and for reception of said authorization.

27. The method of claim 15 further comprising the steps of:

said user indicating a desire for a selected data feature beyond any features already operable or already unlocked;

informing the user that the feature is locked, where said feature is locked unless a valid authorization has been stored for said user-ID and said authorization is still valid;

offering said user information about possible benefits of obtaining access to said locked feature;

offering to said user to provide said user with access to said feature upon agreement with predetermined conditions; and

forming an unlock request for a user who indicates agreement with said at least some of said predetermined conditions.

28. The method of claim 15 in which said selected data feature is selected from the following abilities: to decompress encoded information, to access a text file, to execute a software or hardware program, to access a further distribution channel, to decrypt digital data, to enable a high-quality output, to enable storage of processing results, to access a digitized multimedia file, to enable predetermined hardware or software features of the user's system, and to access an analog playback process for an audio, video or multimedia recording.

29. The method of claim 15 in which said selected data features are locked by a transform of either encryption or compression, or both, for which a key is required to reverse each transform; and

a password or authorization provides access to said key;

wherein access to each selected data feature requires a password or authorization which is adequately unique to prevent different users or user's systems from sharing passwords.

30. The method of claim 15 in which at least some of said steps of locking, unlocking, transforming and reverse transforming are carried out in firmware in the user's system.

31. A method for sharing limited access to selected data features of copyable encoded information stored on a server, and for permitting only uniquely identified workstations to unlock said selected data features, comprising the steps of:

locking said selected data feature, having a feature-identifier, with a corresponding key; receiving an unlock request having a unique workstation-identifier and a feature identifier from the workstation;

transforming said key using at least said unique workstation identifier to form an authorization;

transmitting said authorization to said workstation;

reverse transforming said authorization using said unique workstation identifier to obtain the key corresponding to said feature-identifier; and

using said key to unlock said selected data feature;

whereby said key can only be used to access the selected data feature from a unique workstation-identifier.

32. The method of claim 31 in which authorizations formed for a given workstation are then stored on the server in workstation-specific locations.

33. The method of claim 31 in which said unique workstation identifiers are constructed such that any workstation identified as being on the same network can use the same authorization for the selected data feature of the encoded information.

APPENDIX OF RELATED PROCEEDINGS



PRECEDENTIAL OPINION

Pursuant to the Board of Patent Appeals and Interference's Standard Operating Procedure 2, the opinion below has been designated a precedential opinion.

Paper No. 78

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte CARL A. LUNDGREN

Appeal No. 2003-2088
Application 08/093,516

HEARD: April 20, 2004

Before FLEMING, Chief Administrative Patent Judge, HARKCOM, Vice Chief Administrative Patent Judge, and HAIRSTON, JERRY SMITH, and BARRETT, Administrative Patent Judges.

PER CURIAM.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134(a) from the rejection of claims 1, 2, 6, 7, 19-22, 32, and 35-40, all the claims pending in the application.

Claim 1 is representative of the subject matter on appeal and reads as follows:

1. A method of compensating a manager who exercises administrative control over operations of a privately owned primary firm for the purpose of reducing the degree to which prices exceed marginal costs in an industry, reducing incentives for industry collusion between the primary firm and a set of comparison firms in said industry, or reducing incentives for coordinated special interest industry lobbying, said

set of comparison firms including at least one firm, said primary firm having the manager who exercises administrative control over said primary firm's operations during a sampling period, wherein privately owned means not wholly government owned, the method comprising the steps of:

- a) choosing an absolute performance standard from a set of absolute performance standards;
- b) measuring an absolute performance of said primary firm with respect to said chosen absolute performance standard for said sampling period;
- c) measuring an absolute performance of each firm of said set of comparison firms with respect to said chosen absolute performance standard for said sampling period, said measurement of performance for each firm of said set of comparison firms forming a set of comparison firm absolute performance measures;
- d) determining a performance comparison base based on said set of comparison firm absolute performance measures by calculating a weighted average of said set of comparison firm absolute performance measures;
- e) comparing said measurement of absolute performance of said primary firm with said performance comparison base;
- f) determining a relative performance measure for said primary firm based on said comparison of said primary firm measurement of absolute performance and said performance comparison base;
- g) determining the managerial compensation amount derived from said relative performance measure according to a monotonic managerial compensation amount transformation; and
- h) transferring compensation to said manager, said transferred compensation having a value related to said managerial compensation amount.

This is the second time this case has been appealed to the Board. In Appeal No. 96-0519, a merits panel reversed the examiner's rejection premised upon 35 U.S.C. § 101 (non-statutory subject matter) of the claims then pending. The panel stated "[w]e find that the claim language recites subject matter that is a practical application of shifting of physical assets to the manager. We note the remaining claims also recite

the above practical application. Therefore, we find statutory subject matter." Paper No. 49, page 7.

Dissatisfied with the outcome of the previous appeal, the Examining Corps filed a "Request for Reconsideration and Rehearing" (Paper No. 50, December 15, 1999) that lists two issues for reconsideration as follows:

1. Whether the invention as a whole is in the technological arts.
2. Assuming that the invention is in the technological arts, whether the claim transferring compensation to a manager is a practical application.

Id., page 2.

Appellant filed a response to the Request for Reconsideration and Rehearing (Paper No. 51, January 13, 2000).

In an opinion (Paper No. 52) mailed March 13, 2001, an expanded panel of the Board remanded the application to the examiner for two reasons. First, the record did not reflect that the examiner had considered and evaluated appellant's response to the Request for Reconsideration and Rehearing, and second, the Office of the Deputy Commissioner for Patent Examination Policy had requested that the application be remanded to the jurisdiction of the patent examiner so that issues regarding "technological arts" and "practical application" could be further considered.

Following further prosecution before the examiner in which the examiner maintained a rejection under 35 U.S.C. § 101 (non-statutory subject matter), appellant filed a second appeal to this Board (Paper No. 64, December 12, 2002), followed by his Appeal Brief (Paper No. 69, March 13, 2003). The examiner filed an Answer on May 1, 2003 (Paper No. 70), that was followed by a Reply Brief (Paper No. 72, June 20, 2003).

Oral argument was held by an expanded panel on April 20, 2004, and the case was taken under advisement.

DISCUSSION

We reverse the examiner's rejection under 35 U.S.C. § 101 (non-statutory subject matter). In reviewing the Examiner's Answer, we find the examiner refers the reader to Paper No. 60 for a statement of the rejection under § 101. We have reviewed Paper No. 60 and find that a rejection under this section of the statute is set forth on pages 4-8 thereof. The examiner states "both the invention and the practical application to which it is directed to be outside the technological arts, namely an economic theory expressed as a mathematical algorithm without the disclosure or suggestion of computer, automated means, apparatus of any kind, the invention as claimed is found non-statutory." Paper No. 60, page 7.

In reviewing the examiner's "Response to Argument" set forth at pages 3-8 of the Examiner's Answer of May 1, 2003, we first note that the examiner states that "the part of the 35 U.S.C. § 101 rejection that asserted that claims 1, 2, 6, 7, 19-22, 32, and 35-40 fail to produce a useful, concrete, and tangible result is withdrawn."¹ By withdrawing this rejection, it can be concluded that the examiner has found that the process claims on appeal produce a useful, concrete, and tangible result.

Since the Federal Circuit has held that a process claim that applies a mathematical algorithm to "produce a useful, concrete, tangible result without pre-

¹ The examiner had instituted two separate rejections under Section 101 in Paper No. 60. The first was on the basis that the claims were "nothing more than an abstract idea which is not associated or connected to any technological art," id., pages 4-7, and second was that the claims did not "achieve a practical result," id., pages 7-8.

empting other uses of the mathematical principle, on its face comfortably falls within the scope of § 101," AT&T Corp. v. Excel Communications, Inc., 172 F.3d 1352, 1358, 50 USPQ2d 1447, 1452 (Fed. Cir. 1999), one would think there would be no more issues to be resolved under 35 U.S.C. § 101. However, the examiner is of the opinion that there is a separate test for determining whether claims are directed to statutory subject matter, i.e., a "technological arts" test.

Thus, the only issue for review in this appeal is, to use the examiner's terminology, "whether or not claims 1, 2, 6, 7, 19-22, 32, and 35-40 are limited to the technological arts, as required by 35 U.S.C. § 101." Examiner's Answer, page 3.

35 U.S.C. § 101 provides:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

As seen, claim 1 on appeal is directed to a process. Thus, one may wonder why there is any issue regarding whether claim 1 is directed to statutory subject matter. The issue arises because the Supreme Court has ". . . recognized limits to § 101 and every discovery is not embraced within the statutory terms. Excluded from such patent protection are laws of nature, physical phenomena and abstract ideas." Diamond v. Diehr, 450 U.S. 175, 185, 209 USPQ 1, 7 (1981). However, in this appeal, the examiner has not taken the position that claim 1 is directed to a law of nature, physical phenomena or an abstract idea, the judicially recognized exceptions to date to § 101. Rather, the examiner has found a separate "technological arts" test in the law and has determined that claim 1 does not meet this separate test.

The examiner finds the separate "technological arts" test in In re Musgrave, 431 F.2d 882, 167 USPQ 280 (CCPA 1970); In re Toma, 575 F.2d 872, 197 USPQ 852 (CCPA 1978); and Ex parte Bowman, 61 USPQ2d 1669 (Bd. Pat. App. & Int. 2001)(non-precedential). We have reviewed these three cases and do not find that they support the examiner's separate "technological arts" test.

In Musgrave, the court reversed a rejection under 35 U.S.C. § 101 that the claims under review therein were non-statutory because it disagreed with the Board that "these claims . . . are directed to non-statutory processes merely because some or all of the steps therein can also be carried out in or with the aid of the human mind or because it may be necessary for one performing the processes to think." Musgrave 431 F.2d at 893, 167 USPQ 289. After so holding, the court went on to observe "[a]ll that is necessary, in our view, to make a sequence of operational steps a statutory 'process' within 35 U.S.C. § 101 is that it be in the technological arts so as to be in consonance with the Constitutional purpose to promote the progress of 'useful arts.' Const. Art. 1, sec. 8."

We do not view the court's statement in Musgrave in regard to the technological arts to have created a separate "technological arts" test in determining whether a process is statutory subject matter. Indeed, the court stated as much in Toma. The court first noted that the examiner in that case had "cited [inter alia, Musgrave] for the proposition that all statutory subject matter must be in the 'technological' or 'useful' arts... ." Toma, 575 F.2d at 877, 197 USPQ at 857. The court then stated that cases such as Musgrave involved what was called at that time a "mental steps" rejection and

observed, "[t]he language which the examiner has quoted was written in answer to 'mental steps' rejections and was not intended to create a generalized definition of statutory subject matter. Moreover, it was not intended to form a basis for a new § 101 rejection as the examiner apparently suggests." Id. at 878, 197 USPQ at 857. We do not believe the court could have been any clearer in rejecting the theory the present examiner now advances in this case.

We have also considered Ex parte Bowman, cited by the examiner. Bowman is a non-precedential opinion and thus, not binding.

Finally, we note that the Supreme Court was aware of a "technological arts test," and did not adopt it when it reversed the Court of Customs and Patent Appeals in Gottschalk v. Benson, 409 U.S. 63, 175 USPQ 673 (1972). As explained in Diamond v. Diehr, 450 U.S. 175, 201, 209 USPQ 1, 14 (1981) (Stevens, J., dissenting) (footnotes omitted):

In re Benson, [441 F.2d 682, 169 USPQ 548 (CCPA 1971)] of course was reversed by this Court in Gottschalk v. Benson, 409 U.S. 63, [175 USPQ 673] (1972). Justice Douglas' opinion for a unanimous Court made no reference to the lower court's rejection of the mental-steps doctrine or to the new technological-arts standard. Rather, the Court clearly held that new mathematical procedures that can be conducted in old computers, like mental processes and abstract intellectual concepts, see id., at 67, [175 USPQ at 674-675], are not patentable processes within the meaning of § 101. (Footnotes omitted.)

Our determination is that there is currently no judicially recognized separate "technological arts" test to determine patent eligible subject matter under § 101. We decline to create one. Therefore, it is apparent that the examiner's rejection can not be sustained. Judge Barrett suggests that a new ground of rejection should be entered

against the claims on appeal. We decline at this stage of the proceedings to enter a new ground of rejection based on Judge Barrett's rationale, because in our view his proposed rejection would involve development of the factual record and, thus, we take no position in regard to the proposed new ground of rejection. Accordingly, the decision of the examiner is reversed.

REVERSED

Michael R. Fleming)	
Chief Administrative Patent Judge)	
)	
)	
)	BOARD OF PATENT
Gary V. Harkcom)	APPEALS
Vice Chief Administrative Patent Judge)	AND
)	INTERFERENCES
)	
)	
Kenneth W. Hairston)	
Administrative Patent Judge)	

JERRY SMITH, Administrative Patent Judge, dissenting.

I would affirm the examiner's rejection. One must understand at the outset that the examiner's rejection raises the question of whether there is a "technological arts" standard implicitly required within the constitutional mandate authorizing Congress to grant patents in order to promote the progress of the useful arts. For purposes of this dissent, the term "technological arts" should be construed to mean nothing more than a threshold nexus to some field of technology to fall within the constitutional mandate. Likewise, any reference to "science" should be interpreted to mean based on scientific principles, which renders a claimed invention as falling within the constitutional mandate.

The issue presented by the examiner is a new one. That is, one can scrutinize as many court decisions as one may like, but there is no decision out there which unequivocally holds that the claimed invention on appeal before us must be granted a patent. Likewise, there is no decision out there that unequivocally holds that the claimed invention on appeal must be denied a patent. Thus, in my view, the issue before us raised by the examiner is one of first impression.

The "technological arts" standard as used by the examiner is intended to represent a more modern term for the reference to "useful arts" in the Constitution. The Constitution authorized the Congress to award patents to inventors in order to promote the progress of the useful arts. While I do not question the power of Congress to pass laws to carry out this mandate, whatever law passed by the Congress cannot be applied in such a manner as to enlarge the constitutional mandate. Thus, any laws

passed by the Congress to grant patents should be applied in a manner that is consistent with the constitutional mandate. My view of this mandate is that an invention must in some manner be tied to a recognized science or technology in order to promote the progress of the useful arts. Although a machine, manufacture, or composition of matter will rarely fail to meet the constitutional mandate, processes represent an especially troublesome type of invention. This is because almost anything can be claimed as a series of steps that technically can be considered a process, but the term process is so broad that it can be used to claim inventions that cover nothing more than human conduct or thought processes that are totally unrelated to any science or technology. Thus, I am not questioning the authority of the Congress to pass 35 U.S.C. § 101, but only the scope being given to the statute by the majority.

The majority is of the view that every invention is patentable unless it is nothing more than an abstract idea, a law of nature or a natural phenomenon, each of which has been held to be unpatentable by court decisions. These categories of nonstatutory subject matter did not come to us by Scripture, however, but instead, resulted from some enlightened individual raising the question of whether such subject matter should be patented. Inventions within these categories certainly can be claimed in a manner which technically comply with 35 U.S.C. § 101. The point is that there is no absolute law that says that every category of nonstatutory subject matter has been decided for all time.

I would affirm the rejection, therefore, not because it is directed to a method of doing business, but rather, because the process as claimed is not tied to any known

science or technology. If the claim recited that the steps were performed by a computer, then I would agree that the claimed invention would at least have met the constitutional "technological arts" standard, although the claimed invention would still need to be analyzed under 35 U.S.C. § 101 for conventional compliance with that section of the statute. There is no science or technology associated with the claimed invention. It is interesting to note that the claimed invention could have been performed by the writers of the Constitution using only the knowledge available at that time. I find it ludicrous, however, to think that the writers of the Constitution would have found the idea of providing compensation to an executive, as claimed, to be something that would qualify for a patent.

As noted above, I believe the issue before us is one of first impression. I have not overlooked the holdings in any of the cases most related to this issue because there is no computer being claimed here so that the most related cases do not apply. In fact, all the "relevant" cases cited by the majority relate to inventions that either specifically recited machines or were clearly performed in an environment that was an accepted science or technology.

If the majority simply wants to take comfort in the idea that all categories of nonstatutory subject matter have been established, and no new categories will be considered, then I disagree. The majority's position that essentially anything that can be claimed as a process is entitled to a patent under 35 U.S.C. § 101 opens the floodgate for patents on essentially any activity which can be pursued by human beings

without regard to whether those activities have anything to do with the traditional sciences or whether they enhance the technological arts in any manner.

Who should raise the question of whether inventions are properly within the constitutional mandate if not the agency charged with applying the statutes? The examiner's rejection is based on a fundamental position that the claimed invention does not fall within the constitutional mandate regarding inventions which may be patented. This is a very important constitutional question. Such constitutional questions cannot be answered by the Congress or even by this Board. The appropriate forum for deciding this question is the federal judiciary. Unfortunately, the federal judiciary cannot get jurisdiction of this issue unless someone takes the issue to it. The majority has ensured that, at least in this case and probably the foreseeable future, the entity best capable of deciding the constitutionality question will not get a chance to consider it. If it should turn out somewhere down the road that the federal judiciary decides that the "technological arts" requirement raised by the examiner is mandated by the Constitution, then it will mean that the invention on appeal before us as well as countless others will have improperly received patents. I cannot be concerned that an affirmance of the examiner's rejection may imply that many other previously issued patents should not have been granted. It cannot possibly be good public policy to continue to issue invalid patents just to be consistent with the past.

I expect that there will be an initial reluctance to accept this position because it is new. I only hope that this decision will open a public discourse on the topic of whether every process that technically falls within the scope of 35 U.S.C. § 101 automatically

recites statutory subject matter. If this decision does nothing more than raise questions about the limits of nonstatutory subject matter that require the Congress to step in and clarify the limits of 35 U.S.C. § 101, then this dissent will have been worthwhile.

Although I would affirm the examiner's rejection as is, I also join Judge Barrett in making a new ground of rejection under 35 U.S.C. § 101. I join Judge Barrett in his exhaustive treatment of why the invention on appeal is unpatentable under 35 U.S.C. § 101.

Jerry Smith
Administrative Patent Judge

) BOARD OF PATENT
) APPEALS
) AND
) INTERFERENCES

BARRETT, Administrative Patent Judge, concurring-in-part and dissenting-in-part.

The majority reverses the examiner's rejection on the narrow ground that there is no separate "technological arts" test under 35 U.S.C. § 101. That is, the majority holds that "technological arts" is the wrong test for statutory subject matter under § 101, but it does not state what the proper test should be and does not expressly say that the claimed subject matter is statutory. I concur with the majority's holding that there is no separate and distinct "technological arts" test. "Technological arts" has been said to be a modern equivalent of the "useful arts" in the U.S. Constitution, which, in my opinion, is fully circumscribed by the four categories of subject matter in § 101. However, I would enter a new ground of rejection for lack of statutory subject matter under § 101 based on different reasoning.

I dissent as to the majority's statement that "[a]s seen, claim 1 on appeal is directed to a process," apparently because it sets forth a series of method steps. In my opinion, not every claim to a series of steps constitutes a "process" under § 101. I also dissent as to statements in the opinion that imply that the sole test for statutory subject matter is the "useful, concrete and tangible result" test because the majority fails to acknowledge that this test was set out in the context of machine claims and machine-implemented process claims, which are not present here. I also dissent from the implied conclusion that the claims recite a "useful, concrete and tangible result" just because the original Board decision in Appeal No. 96-0519 held that "the claim language recites subject matter that is a practical application of shifting physical assets to the manager" (Paper No. 49, page 7), which conclusion has not been vacated, and because the examiner withdrew the rejection based on the failure of the claims to produce a useful, concrete, and tangible result. The examiner may have withdrawn this ground for the rejection simply because he felt that there was no way to overcome the Board's original statement. I do not agree that the claims recite a "practical application, i.e., 'a useful, concrete and tangible result,'" if that is the test.

I consider it the Board's duty to decide cases and to provide guidance to the Examining Corps in cases involving difficult legal questions. Thus, I disagree with the majority's decision not to state the test for statutory subject matter and not to state whether they consider the subject matter to be statutory. This application was filed July 16, 1993, and is the last of a series of continuation applications going back to November 1988. If the outcome of this case is not to issue the application, but to reopen prosecution on some other theory, then I do not think it is fair to the applicant, who has expended so much time, energy, and money in prosecution and waited so long for a decision, to not decide the case now. I consider this case important enough that I would enter a new ground of rejection under § 101 based on different reasoning so that the USPTO might receive some guidance from our reviewing court, the U.S. Court of Appeals for the Federal Circuit.

OUTLINE

THE INVENTION

THE REJECTION

THE ISSUE

LEGAL ANALYSIS OF STATUTORY SUBJECT MATTER

"Useful arts" ("technological arts") of U.S. Constitution

Statutory subject matter - 35 U.S.C. § 101

Statutory classes of § 101 define the "useful arts"

Historical definitions of statutory categories

Machine, manufacture, and composition of matter

Process

Subject matter not within any category

The judicially recognized exclusions

Laws of nature and physical phenomena

Abstract ideas

Two different views of exclusions

Machines and machine-implemented processes: The Federal

Circuit's test in State Street Bank and AT&T

Pre-State Street

State Street and AT&T involved machines

Other discussions

Conclusions

Non-machine-implemented processes

Claims that read on statutory and nonstatutory subject
matter are unpatentable

Conclusion

"Technological arts" test

Transformation of subject matter

Incidental physical limitations

Claims that cover only human activity

ANALYSIS

Claim interpretation

Possible tests

(1) Transformation

(2) Exceptions

(3) "Useful, concrete and tangible result"

(4) "Technological arts"

Analysis

CONCLUSION

THE INVENTION

The invention relates to a method of compensating a manager of a privately owned firm in an oligopolistic industry for the purpose of reducing incentives for industry collusion between the firm and other firms in the industry. Although the title of the application refers to a "Method and Apparatus," no apparatus is disclosed or claimed.

An oligopoly is an industry structure with a relatively small number of competitors. In an oligopolistic industry structure, there is an incentive for collusion, either overt, covert, or tacit, by managers of the firms to restrict output and artificially raise the price of their products above the price which would result under conditions of perfect competition.

There are said to be two results of oligopolistic collusion: (1) there is a net decrease in the benefit to consumers who consume a good that is priced above the perfect competition price; and (2) there is a net increase in the profit received by the oligopolistic firms producing the goods. However, the net decrease in benefit to consumers is of greater magnitude than the net increase in profits to the firms. The difference between the net decrease in benefits and net increase in profits represents a welfare cost to society. Therefore, it is to the benefit of society to discourage oligopolistic behavior.

Through collusion, a group of managers in an oligopolistic industry can restrict output and raise profits so as to increase profits for all firms in the industry. The claimed invention is said to reduce the likelihood of oligopolistic collusion in an industry comprising two or more firms. The goal of reduced collusion is achieved by tying a manager's compensation to the relative standard of profitability of the firm as opposed to the absolute profitability of the firm.

Managerial compensation based on a relative performance measure (profitability) creates a "zero sum game" for managers of firms in the industry. That is, a manager may increase his or her compensation by increasing his or her firm's relative profitability, but an increase in relative profitability of one firm will necessarily cause a decrease in relative profitability of one or more of the other firms in the industry. In this model, if all managers of firms in the industry are compensated based on the relative profitability of their respective firms, there will be no incentive for collusion.

Claim 1 (seven times amended) is reproduced below.

1. A method of compensating a manager who exercises administrative control over operations of a privately owned primary firm for the purpose of reducing the degree to which prices exceed marginal costs in an industry, reducing incentives for industry collusion between the primary firm and a set of comparison firms in said industry, or reducing incentives for coordinated special interest industry lobbying, said set of comparison firms including at least one firm, said primary firm having the manager who exercises administrative control over said primary firm's operations during a sampling period, wherein [the] privately owned means [is] not wholly government owned, the method comprising the steps of:

a) choosing an absolute performance standard from a set of absolute performance standards;

- b) measuring an absolute performance of said primary firm with respect to said chosen absolute performance standard for said sampling period;
- c) measuring an absolute performance of each firm of said set of comparison firms with respect to said chosen absolute performance standard for said sampling period, said measurement of performance for each firm of said set of comparison firms forming a set of comparison firm absolute performance measures;
- d) determining a performance comparison base based on said set of comparison firm absolute performance measures by calculating a weighted average of said set of comparison firm absolute performance measures;
- e) comparing said measurement of absolute performance of said primary firm with said performance comparison base;
- f) determining a relative performance measure for said primary firm based on said comparison of said primary firm measurement of absolute performance and said performance comparison base;
- g) determining the managerial compensation amount derived from said relative performance measure according to a monotonic managerial compensation amount transaction; and
- h) transferring compensation to said manager, said transferred compensation having a value related to said managerial compensation amount.

THE REJECTION

No references are applied in the rejection.

Claims 1, 2, 6, 7, 19-22, 32, and 35-40 stand rejected under 35 U.S.C. § 101 as being directed to nonstatutory subject matter.

The examiner's reasons for the rejection finally stabilized in the examiner's answer. The examiner states that there is a "two prong" test for statutory subject matter: first, the invention must be within the "technological arts" according to In re Musgrave, 431 F.2d 882, 167 USPQ 280 (CCPA 1970), In re Toma, 575 F.2d 872, 197 USPQ 852 (CCPA 1978), and the Board's decision in Ex parte Bowman, 61 USPQ2d 1669 (Bd. Pat. App. & Int. 2001) (nonprecedential and not designated for publication); and second, the invention must recite a "useful, concrete and tangible result" under State St. Bank & Trust Co. v. Signature Fin. Group, Inc., 149 F.3d 1368, 47 USPQ2d 1596 (Fed. Cir. 1998). The examiner asserts that the Court in State Street

did not mention the "technological arts" test because it had already determined the subject matter to be in the technological arts (examiner's answer, pp. 5-6). The examiner agrees that the claimed invention produces a "useful, concrete and tangible result" (answer, p. 3). The only reasoning maintained by the examiner is that the claimed subject matter is not within the "technological arts" because (answer, pp. 7-8):

[A]ll recited steps could be performed manually by a human as admitted by the Appellant on page 3 of paper no. 51 (filed January 13, 2000) when he stated, "While the calculations recited in Applicant's claimed invention may be carried out on a computer, they also may be carried out by hand calculation, using a hand-held calculator, a slide rule or any combination of such devices." However, the Examiner points out that even as disclosed in the specification, Appellant's invention is limited to steps performed manually by a human; there is no explicit contemplation of the integration of the technological arts anywhere in Appellant's claims or disclosure, thereby reinforcing the fact that Appellant's invention fails to "[p]romote the progress of science and useful arts," as intended by the United States Constitution under Art. I, § 8, cl. 8 regarding patent protection.

THE ISSUE

The issue is whether the subject matter of claim 1 is directed to a statutory "process" under 35 U.S.C. § 101.

The steps of claim 1: relate to an economic or game theory plan; do not recite any specific way of implementing the acts; do not expressly or impliedly recite any transformation of physical subject matter, tangible or intangible, from one state into another; do not recite any electrical, chemical, or mechanical acts or results; indirectly recite transforming data by a mathematical algorithm; do not require performance by a machine, such as a computer, either as claimed or disclosed; could be performed entirely by human beings; and do not involve making or using a machine, manufacture, or composition of matter. I do not believe the outcome is controlled by the Federal Circuit decisions in State St. Bank & Trust Co. v. Signature Fin. Group, Inc., 149 F.3d 1368, 47 USPQ2d 1596 (Fed. Cir. 1998) and AT&T v. Excel Communications, Inc., 172 F.3d 1352, 50 USPQ2d 1447 (Fed. Cir. 1999) because those cases involved transformation of data by a machine, such as a computer. This appeal involves a "non-machine-implemented" process claim, i.e., the claim does not recite how the steps are implemented--the claim is broad enough to read on performing the steps without any machine or apparatus, although it also covers performing the steps with a machine.

The question of whether this type of non-machine implemented subject matter is patentable is a common and important one to the U.S. Patent and Trademark Office (USPTO), as the bounds of patentable subject matter are increasingly being tested. In recent years, the USPTO has been flooded with claims to "processes," many of which bear scant resemblance to classical processes of manipulating or transforming

compositions of matter and of functions performed by machines. The USPTO has learned the lessons from development of the law of machine-implemented processes, particularly when implemented on a general purpose digital computer. "Business methods" have long been considered statutory subject matter when performed by a machine. Technology Center 3600, Workgroup 3620, in the USPTO is entirely dedicated to "Electronic Commerce (Business Methods)" in Class 705, "Data Processing: Financial, Business Practice, Management, or Cost/Price Determination"; see www.uspto.gov/web/menu/pbmethod. The State Street and AT&T cases, often called "revolutionary," involved patented machines or machine-implemented processes that examiners have for some time regarded as nonexceptional. Perhaps encouraged by certain general language in these cases, however, a wide range of ever more general claims to "processes" come before the Office. Many, like the claimed process in the present case, are not limited to implementation via any particular technology or machine, nor do they result in any transformation or manipulation of physical subject matter. Are such "processes" patentable because they are "useful"? Other "process claims" involve what seem to be insubstantial or incidental manipulations of physical subject matter--e.g., the recording of a datum: are these patentable processes? Still other process claims involve human physical activity--methods of throwing a ball, or methods of causing a fumble. Are these process claims patentable? Must the examiners analyze such claims for compliance with the written description and enablement requirements, and search the prior art for evidence of novelty and nonobviousness?

I recognize that § 101 rejections are strongly disfavored by our reviewing court, the U.S. Court of Appeals for the Federal Circuit. Also, examiners find § 101 rejections difficult because it is hard to put reasons into words. It would be more administratively convenient for the USPTO to have a rule that all subject matter is statutory, so that it did not have to make § 101 rejections and could focus its efforts on examining claims for patentability over the prior art. However, that is not the law and, therefore, the USPTO must apply § 101 case law the best it can. I believe that the present claim involves the kind of subject matter that was never intended to be patentable.

LEGAL ANALYSIS OF STATUTORY SUBJECT MATTER

Statutory subject matter is a complicated issue and the caselaw over the last 35 years has not been consistent in part due to broad pronouncements that, while sensible in the context of the facts of each case, proved to be ambiguous when applied to more general process claims. Therefore, the cases and tests cannot be completely reconciled. Nevertheless, the following is my analysis of statutory subject matter. In particular, I emphasize the sections dealing with "Process," "Abstract ideas," and "Claims that read on statutory and nonstatutory subject matter are unpatentable."

"Useful arts" ("technological arts") of U.S. Constitution

The origin of the United States patent laws is in the British Statute of Monopolies of 1623, 21 Jac. 1, ch. 3, which limited grants of monopolies to any "manner of new manufactures." United States v. Line Material Co., 333 U.S. 287, 330-31 (1947) (Burton, J., dissenting). "The term 'manufactures' was broadly construed by the English courts as embracing 'not merely a vendible product of inventive skill, but also a method of applying physical forces to the production of physical effects' (i.e., processes as well as products)." 1 Donald S. Chisum, Patents § 1.01 (2001) (quoting 1 William Robinson, The Law of Patents for Useful Inventions 106 (1890)).

The considerations for the U.S. Constitution are discussed by Karl B. Lutz, Patents and Science, 18 Geo. Wash. L. Rev. 50, 53-54 (1949):

By the year 1787 it was being recognized even in Great Britain that the phrase "new manufactures" was an unduly limited object for a patent system, since it seemed to exclude new processes. Doubts were also being raised as to the advisability of continuing to grant patents to those who introduced new industries from abroad. Both of these questions were resolved in the United States Constitution by broadening the field from "new manufactures" to "useful arts," and by limiting the grants to "inventors" who made "discoveries" in such arts, thus excluding mere importers of foreign technology.

The U.S. Constitution was adopted by convention of States, September 17, 1787, and ratification was completed June 21, 1788. The Constitution authorizes Congress "To promote the Progress of ... useful Arts, by securing for limited Times to ... Inventors the exclusive Right to their ... Discoveries." U.S. Const., art. I, § 8, cl. 8. "This qualified authority ... is limited to the promotion of advances in the 'useful arts.'" Graham v. John Deere Co., 383 U.S. 1, 5, 148 USPQ 459, 462 (1966).

"[T]he present day equivalent of the term 'useful arts' employed by the Founding Fathers is 'technological arts.'" In re Bergy, 596 F.2d 952, 959, 201 USPQ 352, 359 (CCPA 1979), aff'd sub nom. Diamond v. Chakrabarty, 447 U.S. 303, 206 USPQ 193 (1980); In re Musgrave, 431 F.2d 882, 893, 167 USPQ 280, 289-90 (CCPA 1970) (A series of operational steps is a statutory process if it is "in the technological arts so as to be in consonance with the Constitutional purpose to promote the progress of 'useful arts.'"); In re Prater (Prater I) 415 F.2d 1378, 1389, 159 USPQ 583, 593 (CCPA 1968) ("a process disclosed as being a sequence or combination of steps, capable of performance without human intervention and directed to an industrial technology--a 'useful art' within the intendment of the Constitution ..."), modified on rehearing, 415 F.2d 1393, 162 USPQ 541 (1969) (Prater II); In re Waldbaum (Waldbaum I), 457 F.2d 997, 1003, 173 USPQ 430, 434 (CCPA 1972) ("The phrase 'technological arts,' as we have used it, is synonymous with the phrase 'useful arts' as it appears in Article I, Section 8 of the Constitution."); Lutz, 18 Geo. Wash. L. Rev. at 54 ("The term 'useful arts,' as used in the Constitution and in the titles of the patent statutes [before the 1952 Patent Act] is best represented in modern language by the word 'technology.'")

This word is defined in Webster's New International Dictionary (2nd edition 1942) as: 'Any practical art utilizing scientific knowledge, as horticulture or medicine; applied science contrasted with pure science.' (3rd definition.). Another synonym is "industrial arts." See Robinson § 157 ("Every invention in the industrial arts is either an operation [process] or an instrument [machine, manufacture, or composition of matter].").

"Technology" is defined as: "2a: applied science b: a technical method of achieving a practical purpose 3: the totality of means employed to provide objects necessary for human sustenance and comfort." Webster's New Collegiate Dictionary (G.&C. Merriam Co. 1977). "Science" is defined as:

1a: possession of knowledge as distinguished from ignorance or misunderstanding b: knowledge attained through study or practice 2a: a department of systematized knowledge as an object of study <the ~ of theology> b: something (as a sport or technique) that may be studied or learned like systematized knowledge c: one of the natural sciences 3a: knowledge covering general truths or the operation of general laws esp. as obtained and tested through scientific method b: such knowledge concerned with the physical world and its phenomena : NATURAL SCIENCE 4: a system or method based or purporting to be based on scientific principles.

Id. The definition of "science" that applies is "natural science," not knowledge in general. The Constitution gave Congress the power "To promote the Progress of Science and useful Arts." "The term 'useful arts,' as used in the Constitution ... is best represented in modern language by the word 'technology.'" Lutz, 18 Geo. Wash. L. Rev. at 54. As described by Lutz:

The word "science," which comes from the Latin, scire, "to know" at the writing of the Constitution meant learning in general. Such a use is found in a letter by Thomas Jefferson in 1799, in which he referred to "government, religion, morality, and every other science."

Id. at 51-52. "Natural science" is defined as "any of the sciences (as physics, chemistry, or biology) that deal with matter, energy, and their interrelations and transformations or with objectively measurable phenomena." Webster's. "Applied" is defined as "put to practical use; esp: applying general principles to solve definite problems." Id. "Engineering" is defined as "2: the application of science and mathematics by which the properties of matter and the sources of energy in nature are made useful to man in structures, machines, products, systems, and processes." Id. In my opinion, the definition of "engineering" best describes what is meant by "technology" and the "useful arts."

To further get a grasp on what is meant by "technology" I note a basic concept of the physical world. As explained in Gillespie et al., Chemistry 2 (Allyn and Bacon, Inc. 1986):

We can describe the universe, and all the changes occurring in it, in terms of two fundamental concepts: matter and energy. Matter is anything that occupies space and has mass. Water, air, rocks, and petroleum, for example, are matter, but heat and light are not; they are forms of energy. The many different kinds of matter are known as substances. . . .

When we refer to "structure" or "material" or "substance" we are talking about matter and things made up of matter. Energy is further defined at Chemistry 53:

The capacity to do work is called energy. Gasoline, for example, possesses energy because when it is burned, it can do the work of moving a car. We measure energy by the work done, and thus energy, like work, is measured in joules.

In practice, it is convenient to distinguish different forms of energy, such as heat energy, light energy, electric energy, and chemical energy. . . .

Energy has physical existence because it is capable of doing work and of being measured, but is incorporeal. I submit that a fundamental property of "technology" is that it deals with the physical world, matter and energy, which are transformed and made useful to man in products and processes.

The Constitution was enacted at the beginning of the Industrial Revolution, which was both a series of technological and social innovations originating in England. The invention of the cotton-spinning jenny by James Hargreaves is usually pointed out as the first, major technological innovation of the Industrial Revolution. Prior to that time cotton had to be stretched out or spun into threads by a slow process, one thread at a time, by a machine called a spinning wheel. "Patented in 1767, the spinning jenny was a series of simple machines rather than a single machine, and it spun sixteen threads of cotton simultaneously. These two qualities: multiple machines in a single machine as well as a machine that was designed not just to speed up work, but to do the work of several laborers simultaneously, was the hallmark of all subsequent technological innovations." See www.wsu.edu:8080/~dee/ENLIGHT/INDUSTRY.HTM.

The spinning jenny and the water frame invented by Richard Arkwright circa 1769 allowed ten times as much cotton yarn to be manufactured in 1790 than had been possible twenty years before. The invention of the coal-fired rotary steam engine by James Watt in 1782 allowed spinning factories to be located almost anywhere and powered the machines of the Industrial Revolution. In 1784, Henry Cort invented the puddling process for iron production, which allowed pig iron to be refined from coke (which is made from coal which is abundant in England) instead of charcoal (which is made from less available wood). See www.historyguide.org/intellect/lecture17a.html.

Against this background, it is likely that the Drafters of the Constitution envisioned protecting tangible manufactured products and physical methods of making products, operating machines, and working with the manifestations of the physical world (matter and energy).

Statutory subject matter - 35 U.S.C. § 101

Congress has defined patentable subject matter in consistent terms for over 210 years. The first United States Patent Act in 1790 required that the applicant "have invented or discovered any useful art, manufacture, engine, machine, or device, or any improvement therein." Act of April 10, 1790, ch. 7, § 1, 1 Stat. 109. The language was amended three years later to require that the applicant "have invented any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement [thereof]." Act of February 21, 1793, ch. 11, § 1, 1 Stat. 318. The order and form of the words "invent" and "discover" changed several times over subsequent acts, but the statutory classes remained unchanged until the Patent Act of 1952 changed "art" to "process" and defined "process" as "process, art or method." See 1 Patents § 1.01. A "process" had long been considered to be a "useful art." See Corning v. Burden, 56 U.S. 252, 267 (1854) ("A process, *eo nomine*, is not made the subject of a patent in our act of Congress. It is included under the general term 'useful art.'").

Section 101 of Title 35 U.S.C. sets forth the subject matter that can be patented:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

"[N]o patent is available for a discovery, however useful, novel, and nonobvious, unless it falls within one of the express categories of patentable subject matter of 35 U.S.C. § 101." Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 483, 181 USPQ 673, 679 (1974). The statutory categories of § 101 define eligible (patentable or statutory) subject matter, i.e., subject matter that can be patented. The last phrase, "subject to the conditions and requirements of this title," makes it clear that § 101 is limited to the subject matter that can be patented. See S. Rep. No. 1979, 82d Cong., 2d Sess. 5 (1952), reprinted in 1952 U.S. Code Cong. & Admin. News 2394, 2399 ("A person may have 'invented' a machine or manufacture, which may include anything under the sun made by man, but it is not necessarily patentable under section 101 unless the conditions of the title are fulfilled."). The terms "new and useful" refer to conditions for patentability of subject matter that is eligible to be patented. "It may be useful to think of eligibility as a precondition for patentability, and of utility as one of the three fundamental conditions for patentability, together with novelty ... and nonobviousness" Robert L. Harmon, Patents and the Federal Circuit 40 (4th ed. Bureau of National

Affairs, Inc. 1998). Thus, as a matter of terminology, subject matter that does not fall within one of the statutory classes is said to be "nonstatutory" or "unpatentable" subject matter, with utility being a separate requirement for patentability.

The § 101 terms "invents" and "discovers" are discussed in A.W. Deller, 1 Deller's Walker on Patents § 14 (2d ed. Baker, Voorhis & Co., Inc. 1964):

The words "discover" and "discovery," as used in the Constitution and patent laws of the United States, do not have their broadest signification. In their primary and ordinary sense, they are not synonymous with "invent" and "invention." Webster in his dictionary defines the word "discover" in the following language:--"Discover differs from invent. We discover what before existed. We invent what did not before exist." Section 100 of Title 35 USC states that the term "invention" means invention or discovery. Webster's definition of invention is as follows:--"Invention differs from discovery. Invention is applied to the contrivance and production of something that did not before exist. Discovery brings to light that which existed before, but which was not known." A "discovery" in this sense is not the subject of a patent; and as stated in *In re Kemper*, [14 F. Cas. 286, 287 (1841),] "it will be found, by a careful perusal of the Constitution and laws of the United States upon the subject of patents for useful arts, etc., that it (discovery) is not there used in this sense, but always as synonymous with invention." No discovery will entitle the discoverer to a patent which does not in effect amount to the contrivance or production of something which did not exist before; or, in other words, to an invention. [Footnotes omitted.]

Not every discovery is patentable. See Morton v. New York Eye Infirmary, 17 F. Cas. 879, 884 (S.D.N.Y. 1862):

A discovery may be brilliant and useful, and not patentable. No matter through what long, solitary vigils, or by what importunate efforts, the secret may have been wrung from the bosom of Nature, or to what useful purpose it may be applied. Something more is necessary. The new force or principle brought to light must be embodied and set to work, and can be patented only in connection or combination with the means by which, or the medium through which, it operates.

Thus, the discovery of a law of nature, a principle of a physical science, or a natural phenomenon is not patentable because it existed before and is not an invention. It is only when the discovery or principle is utilized in an invention that is a "process, machine, manufacture, or composition of matter" under § 101 that it becomes eligible for protection. See Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948) ("He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a

discovery, it must come from the application of the law of nature to a new and useful end."); Mackay Radio & Tel. Co., Inc. v. Radio Corp. of America, 306 U.S. 86, 94 (1939) ("While a scientific truth, or the mathematical expression of it, is not patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be."); 1 Deller's § 14 (describing the example that discoveries about laws of nature, such as electric current, conduction of materials, and magnetism were not patentable, but the application of these laws and principles in the telegraph by Morse was patentable).

Statutory classes of § 101 define the "useful arts"

"Congress intended statutory subject matter to 'include anything under the sun that is made by man.'" Diamond v. Diehr, 450 U.S. 175, 182, 209 USPQ 1, 6 (1981) (quoting from S. Rep. No. 1979, reprinted in 1952 U.S. Code Cong. & Admin. News at 2399 ("A person may have 'invented' a machine or manufacture, which may include anything under the sun made by man, but it is not necessarily patentable under section 101 unless the conditions of the title are fulfilled.")). (The Senate Report does not mention "composition of matter" or "process.") "[T]he use of the four terms [process, machine, manufacture, and composition of matter] represent an effort to indicate the general industrial boundary of the single field of patentable invention." [Emphasis ours.] The first three terms, machines, manufactures and composition of matter, refer to physical things, while the fourth, process, refers to acts. Hence the general field may be considered as consisting of new things and new acts." Bergy, 596 F.2d at 974 n.11, 201 USPQ at 372 n.11 (citing Glasscock and Stringham, Patent Law 22 (1943)). The four categories define the "useful arts" ("technological arts") as discussed in 1 Patents § 1.01:

The general purpose of the statutory classes of subject matter is to limit patent protection to the field of applied technology, what the United States constitution calls "the useful arts." Theoretical or abstract discoveries are excluded as are discoveries, however practical and useful, in nontechnological arts, such as the liberal arts, the social sciences, theoretical mathematics, and business and management methodology. This focus on technology explains the preoccupation of patent law with means. A patent can issue only for a new means of achieving a useful end or result. Those who articulate new problems or recognize new needs frequently make valuable contributions to society but cannot look to the patent system for reward unless they go on to find a new and specific process, machine, manufacture, or composition of matter that solves the problem or meets the need. [Footnotes omitted.]

"Thus patent law rewards persons for inventing technologically useful applications, instead of for philosophizing unapplied research and theory." In re Alappat, 33 F.3d 1526, 1553, 31 USPQ2d 1545, 1565 (Fed. Cir. 1994) (en banc) (Archer, C.J., concurring in part and dissenting in part).

Historical definitions of statutory categories

It is useful to define the § 101 categories of "process, machine, manufacture, or composition of matter." "These terms may not be read in a strict literal sense entirely divorced from the context of the patent law." Id. (citing, *inter alia*, In re Schrader, 22 F.3d 290, 295-96 & n.11, 30 USPQ2d 1455, 1459-60 & n.11 (Fed. Cir. 1994)).

Machine, manufacture, and composition of matter

The three product classes of machine, manufacture, and composition of matter have traditionally required physical structure or substance. "The term machine includes every mechanical device or combination of mechanical powers and devices to perform some function and produce a certain effect or result." Corning v. Burden, 56 U.S. at 267; *see also* Burr v. Duryee, 68 U.S. 531, 570 (1863) ("A machine is a concrete thing, consisting of parts or of certain devices and combinations of devices."). In modern parlance, electrical circuits and devices, such as computers, are referred to as machines. "Manufactures" and "compositions of matter" are defined in Diamond v. Chakrabarty, 447 U.S. at 308, 206 USPQ at 196-97:

[T]his Court has read the term "manufacture" in accordance with its dictionary definition to mean "the production of articles for use from raw or prepared materials by giving to these materials new forms, qualities, properties, or combinations, whether by hand-labor or by machinery." American Fruit Growers, Inc. v. Brogdex Co., 283 U.S. 1, 11 (1931). Similarly, "composition of matter" has been construed consistent with common usage to include "all compositions of two or more substances and ... all composite articles, whether they be results of chemical union, or of mechanical mixture, or whether they be gases, fluids, powders or solids." Shell Development Co. v. Watson, 149 F. Supp. 279, 280 (D.C. 1957) (citing 1 A. Deller, *Walker on Patents* § 14, p. 55 (1st ed. 1937)). [Parallel citations omitted.]

The statutory categories of "machine, manufacture, or composition of matter" broadly cover every possible "thing" that can be made by man. Included are living things made by man. *See* Diamond v. Chakrabarty, 447 U.S. at 313, 206 USPQ at 199 (man-made micro-organism falls within § 101: Congress recognized that "the relevant distinction was not between living and inanimate things, but between products of nature, whether living or not, and human-made inventions."); J.E.M. Ag Supply, Inc. v. Pioneer Hybrid Int'l, Inc., 534 U.S. 124, 145, 60 USPQ2d 1865, 1874 (2001) (newly developed plant breeds fall within § 101). Structure and materials made by man clearly

fit the definition of "technology." While a machine and a manufacture can only be made by man, a composition of matter can be made by man or naturally occurring.

Process

The most difficult category to define is a "process." A "process" is broadly defined in the dictionary as "a series of actions or operations conducing to an end." Webster's. Any series of actions or operations is a process within the dictionary definition. However, not every method or process in the dictionary sense is a patentable "process" under §§ 100(b) and 101 within the "useful arts" ("technological arts"). See Gottschalk v. Benson, 409 U.S. at 64, 175 USPQ 674 ("The question is whether the method described and claimed is a 'process' within the meaning of the Patent Act."); Parker v. Flook, 437 U.S. 584, 588 n.9, 198 USPQ 193, 196 n.9 (1978) ("The statutory definition of 'process' is broad.... An argument can be made, however, that this Court has only recognized a process as within the statutory definition when it either was tied to a particular apparatus or operated to change materials to a 'different state or thing.'"); id. at 589, 198 USPQ at 197 ("The holding [in Gottschalk v. Benson] that the discovery of that method could not be patented as a 'process' forecloses a purely literal reading of § 101."); Musgrave, 431 F.2d at 893, 167 USPQ at 289-90 (a series of operational steps must be in the technological arts to be a statutory process); In re Sarkar, 588 F.2d 1330, 1333, 200 USPQ 132, 137 (CCPA 1978) ("Though every set of steps, of whatever nature, may properly be labeled a 'process,' § 101 ('Whoever invents') limits the patent system to invented processes ... [and] inventions which Congress is constitutionally empowered to make are tangible embodiments of ideas in the useful, or technological, arts.... Thus, a series of steps is a 'process' within § 101 unless it falls within a judicially determined category of nonstatutory subject matter exceptions."); John Hogg Austin, The Patentable Invention, 18 J. Pat. Off. Soc'y 738, 748 (1936) ("The statutory classification, considered in its totality, limits 'art' [now 'process'] by interpretation to the industrial methods of the artisan according to the general character of the other three classes."); A.H. Walker, The Law of Patents § 3 (5th ed., Baker, Voorhis & Co. 1917) ("The word 'art' [now 'process'] also has a narrower meaning in the patent laws than it has in the dictionaries. In the latter its significance is 'the use of means to produce a result.' In the patent laws it covers only a certain limited meaning of the word process.").

Section 100(b) of Title 35 U.S.C. defines "process" to mean "process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material." The definition of "process" to mean "process, art or method" makes it clear that the terms are synonymous. See S. Rep. No. 1979, reprinted in 1952 U.S. Code Cong. & Admin. News at 2409-10. "When Congress approved the addition of the term 'process' to the categories of patentable subject matter in 1952, it incorporated the definition of 'process' that had evolved in the courts" (footnotes omitted); Schrader, 22 F.3d at 295, 30 UPSQ2d at 1459, which included this definition from Cochrane v. Deener, 94 U.S. 780, 788 (1877): "A process is . . . an act,

or series of acts, performed upon the subject matter to be transformed and reduced to a different state or thing." See Diamond v. Diehr, 450 U.S. at 185, 209 USPQ at 7 ("Analysis of the eligibility of a claim of patent protection for a 'process' did not change with the addition of that term to § 101. Recently, in Gottschalk v. Benson, ... we repeated the above definition recited in Cochrane v. Deener, adding: 'Transformation and reduction of an article "to a different state or thing" is the clue to the patentability of a process claim that does not include particular machines.'). The transformation definition has frequently been misunderstood to require transformation of an object or article. See Schrader, 22 F.3d at 295 & 295 n.12, 30 USPQ2d at 1459-60 & 1459 n.12 (noting imperfect statements requiring object or article in 1 William C. Robinson, The Law of Patents for Useful Inventions § 159 (1890) and Gottschalk v. Benson, 409 U.S. 63, 175 USPQ 673 (1972)). However, the "subject matter" transformed does not need to be a physical (tangible) object or article or substance, but can be physical, yet intangible, phenomena such as electrical signals or electromagnetic waves. See Schrader, 22 F.3d at 295 n.12, 30 USPQ2d at 1459 n.12 ("In the Telephone Cases, 126 U.S. 1 ... (1887), the Court upheld the validity of a claim directed to a method for transmitting speech by impressing acoustic vibrations representative of speech onto electrical signals. If there was a requirement that a physical object be transformed or reduced, the claim would not have been patentable.... Thus, it is apparent that changes to intangible subject matter representative of or constituting physical activity or objects are included in this definition"); In re Ernst, 71 F.2d 169, 170, 22 USPQ 28, 29-30 (CCPA 1934); Prater I, 415 F.2d at 1387-88, 159 USPQ at 592 (discussing the Telephone Cases); 2 A.W. Deller, Patent Claims (2d ed. 1971), § 379 (process claims do not require transforming physical matter: "Another line along which the field of process claims has been extended by judicial approval is the production of power, light, heat, sound, electricity and by-products of their regulation, such as telephonically transmitted speech."). This misunderstanding may be the reason why "transformation of subject matter" has not been accepted as the test for statutory subject matter of "process" claims.

In my opinion, the Supreme Court's definition of a statutory "process" as requiring that the steps operate to physically transform physical subject matter (matter or some form of energy) to a different state or thing succinctly describes the fundamental characteristic of "technology" and a process in the "useful arts" ("technological arts"). This definition is consistent with the meaning given to "arts" during the first 100 years of our patent system. See Robinson §§ 157-172 and "process" cases summarized in Gottschalk v. Benson. An "art" (now "process") historically referred to methods performed by new and known machines, methods of manufacture (making and treating machines, manufactures, and compositions of matter), and methods of controlling natural forces, not just any series of steps without regard to whether it produces some physical effect. See Robinson § 166 ("But though an art embraces so wide a field of inventive skill, it includes only such operations as are capable of producing physical effects."). Moreover, the Supreme Court's test is relatively objective compared to other tests because it is possible to identify and discuss

the physical subject matter (matter or form of energy) being transformed and the physical steps used to transform it. For example, a thermodynamic process for converting heat into some other form of energy, such as mechanical force or motion is patentable even though heat, force, and motion are not tangible objects. A method that does not operate on matter or some form of energy in the physical universe is not "useful" to mankind in the technological sense of the Constitution's "useful arts." Nonstatutory methods include disembodied plans and schemes: for becoming rich, for a system of government, for the more efficient conduct of business, for a way of giving a discount, for playing games (e.g., bidding in bridge or betting in poker), for budgeting, for marketing products, etc. Not all physical acts perform a statutory transformation, e.g., a method of negotiating a contract, while it might involve physical acts, such as talking and writing, only transforms the rights and obligations of the parties.

The general statement in Sarkar that "a series of steps is a 'process' within § 101 unless it falls within a judicially determined category of nonstatutory subject matter exceptions," 588 F.2d at 1333, 200 USPQ at 137, taken in isolation, is admittedly inconsistent with our position that a series of steps must first meet the transformation of subject matter definition to be considered a statutory "process." The term "exceptions" is normally used to refer to subject matter that would be within one of the four categories of § 101 "but for" some exceptional condition, as will be discussed infra. The general statement in Sarkar is considered to be dicta, because it is contradicted by the court's own analysis, which identifies two statutory requirements--that patentable processes be "invented," and that they be "tangible embodiments of ideas in the useful, or technological, arts." 588 F.2d at 1333, 200 USPQ at 137. Perhaps the transformation test and the exception test are the same. I think a more accurate statement is found in In re Pardo, 684 F.2d 912, 916, 214 USPQ 673, 677 (CCPA 1982): "[A]ny process, machine, manufacture, or composition of matter constitutes statutory subject matter unless it falls within a judicially determined exception to section 101." This statement says that subject matter must be within one of the categories before it is tested to determine whether it falls within an exception, which allows the interpretation that a series of steps must first qualify as a "process" under § 101. In my opinion, whether a series of steps initially falls within the statutory class of a "process," applying the Supreme Court's definition of transformation of subject matter, should be treated as a separate issue from whether it is within an exception.

Machine-implemented methods (processes tied to a particular machine or apparatus) are generally considered to be statutory subject matter. This is consistent with the transformation of subject matter definition because machines carry out physical transformations on tangible objects and substances, such as in manufacturing operations, and on nontangible physical phenomena, such as the conversion of electrical signals or the conversion of heat into other forms of energy (thermodynamics). Moreover, the performance of physical operations by a machine is clearly the kind of subject matter which was intended to be protected by the "useful arts" ("technological arts") as evidenced by the fact that the Constitutional provision was enacted in the

context of the Industrial Revolution when the productivity of machines was being improved and machines were replacing manual operations. However, although there is always some form of physical transformation of electrical signals into a different state or signal within a computer, transformation of data by a known machine (e.g., a new use of a known general purpose digital computer) has evolved into a special case because of mathematical algorithms, which will be discussed in connection with State Street and AT&T, *infra*.

It is possible that exceptions exist to the requirements that a "process" must be tied to a particular machine or apparatus or must operate to change subject matter to "a different state or thing." See Gottschalk v. Benson, 409 U.S. 63, 71, 175 USPQ 673, 676 (1972), *rev'g In re Benson*, 441 F.2d 682, 169 USPQ 548 (CCPA 1971) ("It is argued that a process patent must either be tied to a particular machine or apparatus or must operate to change articles or materials to a 'different state or thing.' We do not hold that no process patent could ever qualify if it did not meet the requirements of our prior precedents."); Parker v. Flook, 437 U.S. at 588 n.9, 198 USPQ at 196 n.9 ("The statutory definition of 'process' is broad.... An argument can be made, however, that this Court has only recognized a process as within the statutory definition when it either was tied to a particular apparatus or operated to change materials to a 'different state or thing.' See Cochrane v. Deener, 94 U.S. 780, 787-888, 24 L.Ed. 139. As in Benson, we assume that a valid patent may issue even if it does not meet one of these qualifications of our earlier precedents. 409 U.S. at 71, 93 S.Ct., at 257."). However, great care should be taken before abandoning or creating exceptions to a definition which has proven useful over many years.

The Federal Circuit stated that a "'physical transformation' ... is not an invariable requirement, but merely one example of how a mathematical algorithm may bring about a useful application," AT&T, 172 F.3d at 1358, 50 USPQ2d at 1452. However, the court noted that "the claims require the use of switches and computers," 172 F.3d at 1355, 50 USPQ2d at 1449, and transformation of data by a machine inherently requires a physical transformation. Thus, the statement in AT&T was not necessary and is dicta. Transformation of data by a machine is a special case. The court in AT&T might have been saying that statutory subject matter does not require "physical transformations" performed externally to the machine, such as using the calculated results to control a system. *Cf.* State Street, 149 F.3d at 1375, 47 USPQ2d at 1602 (Claim 1 is "statutory subject matter, even if the useful result is expressed in numbers, such as price, profit, percentage, cost, or loss.").

A statutory "process" is not limited to the means disclosed for performing it. As stated in Cochrane v. Deener:

That a process may be patentable, irrespective of the particular form of the instrumentalities used, cannot be disputed. If one of the steps of a process be that a certain substance is to be reduced to a powder, it may not be at all

material what instrument or machinery is used to effect that object, whether a hammer, a pestle and mortar, or a mill. Either may be pointed out; but if the patent is not confined to that particular tool or machine, the use of the others would be an infringement, the general process being the same. A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed on the subject-matter to be transformed and reduced to a different state or thing.

94 U.S. at 787-88. See also Prater I, 415 F.2d at 1388, 159 USPQ at 592 ("[A] process is not limited to the means used in performing it." (Emphasis omitted.)). Indeed, it is possible for a statutory "process" to be performed manually. In In re Tarczy-Hornoch, 397 F.2d 856, 158 USPQ 141 (CCPA 1968), which overruled the "function of a machine" rejection of process claims, Judge Rich discussed the history of the doctrine and noted that even the "function of a machine" rejection did not apply where the process could be performed manually or by different apparatus. For example, "Walker on Patents, 4th ed. § 3, states that valid process patents may be granted for 'operations which consist entirely of mechanical transactions, but which may be performed by hand or by any of several different mechanisms or machines,'" id. at 864, 158 USPQ at 147, and "[t]he Expanded Metal and Waxham processes could have been performed in some manual fashion or by apparatus different from that disclosed by the patents," id. at 864, 158 USPQ at 148. It is implicit, however, that a statutory "process" still requires a physical transformation of physical subject matter (matter or energy) to a different state or thing if it is not tied to a particular machine. See Gottschalk v. Benson, 409 U.S. at 70, 175 USPQ at 676 ("Transformation and reduction of [subject matter] 'to a different state or thing' is the clue to patentability of a process claim that does not include particular machines.").

There is usually no difficulty identifying the physical transformation of subject matter even where no specific structure is recited. For example, a step of "mixing" two chemicals to produce a manufacture or composition of matter is a physical chemical and/or mechanical act, regardless of whether it is performed by a machine or a human.

Other times, it will be more difficult to determine whether there is a transformation. In my opinion, the physical transformation of physical subject matter to a different state or thing, as required by a statutory "process" under § 101, is evidenced by chemical (including biotechnical), electrical (including computer), or mechanical (i.e., physical forces applied by a machine or a human to matter or energy) steps, i.e., physical transformation steps so as to be within the "useful arts." See Corning v. Burden, 56 U.S. at 267 ("But where the result or effect is produced by chemical action, by the operation or application of some element or power of nature, or of one substance to another, such modes, methods, or operations are called processes."); Expanded Metal Co. v. Bradford, 214 U.S. 366, 385-86 (1909) (process not limited to chemical actions, but includes electrical and mechanical operations); 2 Patent Claims, Chapter XXIV on "Process Claims," §§ 381-383 (chemical, mechanical, and electrical processes). Cf. In re Iwahashi, 888 F.2d 1370, 1374, 12 USPQ2d 1908, 1911 (Fed. Cir. 1989) ("[E]very

step-by-step process [under § 101], be it electronic or chemical or mechanical involves an algorithm in the broad sense of the term.... This is why the proscription against patenting has been limited to mathematical algorithms...."). "A manufacturing process is clearly an art [process], within the meaning of the law." Tilghman v. Proctor, 102 U.S. 707, 722 (1881). Operations of a machine are also processes. See Tarczy-Hornoch, 397 F.2d at 866, 158 USPQ 149 (overruling the "function of an apparatus" doctrine). Not all physical actions cause a transformation of physical subject matter (matter or energy), e.g., "negotiating a contract," "convening a meeting," etc. Of course, not every step must perform a physical transformation, only the claim as a whole must perform a statutory transformation.

However, as with any test, "[t]he line between a patentable 'process' and an unpatentable 'principle' is not always clear." Parker v. Flook, 437 U.S. at 590, 198 USPQ at 197. Incidental physical limitations, such as data gathering, field of use limitations, and post-solution activity, although they may involve physical transformations, are not enough to convert a nonstatutory "abstract idea" into a statutory "process." See "Incidental physical limitations," infra. A claim may contain a data gathering step that requires a physical transformation, but if the claim "as a whole" is not directed to a physical transformation, the claim will not be statutory subject matter. See, e.g., In re Grams, 888 F.2d 835, 12 USPQ2d 1824 (Fed. Cir. 1989) (sole physical step of "performing said plurality of clinical tests on the individual to measure the values of the set of parameters" did not convert it to a statutory process). The test is based on the claim "as a whole."

The statutory subject matter problem arises when a claimed series of steps is not tied to a particular machine or apparatus, and it cannot be determined that the steps of the claim as a whole are physical process steps transforming subject matter (matter or a form of energy) to a different state or thing.

Subject matter not within any category

Some man-made subject matter fails to fall within any of the statutory categories. See In re Warmerdam, 33 F.3d 1354, 1361, 31 USPQ2d 1754, 1760 (Fed. Cir. 1994) (data structure per se of claim 6 is not in one of the categories of § 101); In re Bonczyk, 10 Fed. Appx. 908 (Fed. Cir. 2001) (non-precedential) ("fabricated energy structure" does not correspond to any statutory category of subject matter). Music, art, and literature, if claimed as such, do not fit into any of the statutory categories because they are not physical things or acts. Another example seen in the USPTO is a claim to a computer program per se, i.e., a claim reciting solely a program comprising a set of computer instructions for performing certain functions, instead of a series of steps performed on a computer. The instructions are not physical things which would qualify as a machine, manufacture, or composition of matter, and the claim is not recited as a series of steps as a process. Thus, a computer program per se is not statutory subject matter because it does not fall within any statutory class. See In re Chatfield,

545 F.2d 152, 159, 191 USPQ 730, 737 (CCPA 1976) (Rich, J., dissenting) ("It has never been otherwise than perfectly clear to those desiring patent protection on inventions which are new and useful programs for general purpose computers (software) that the only way it could be obtained would be to describe and claim (35 U.S.C. § 112) the invention as a 'process' or a 'machine.'"); In re Lowry, 32 F.3d 1579, 32 USPQ2d 1031 (Fed. Cir. 1994) (memory containing a stored data structure was statutory subject matter, which has been interpreted to mean that programs stored on a physical medium are statutory subject matter as a "manufacture").

A series of steps which is not tied to a particular machine or apparatus, and which does not transform physical subject matter to a different state or thing, does not meet the statutory definition of a "process" and is not patentable subject matter. It should not be necessary to address whether such a process which does not meet the definition also fits within one of the judicially recognized exclusions.

The judicially recognized exclusions

"Congress intended statutory subject matter to 'include anything under the sun that is made by man.'" Diamond v. Diehr, 450 U.S. at 182, 209 USPQ at 6. "This Court has undoubtably recognized limits to § 101 and every discovery is not embraced within the statutory terms. Excluded from such patent protection are laws of nature, physical phenomena and abstract ideas." Id. at 185, 209 USPQ at 7. Note the Supreme Court's use of the term "[e]xcluded"; the three categories are often referred to as "exceptions." "Phenomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable as they are the basic tools of scientific and technological work." Gottschalk v. Benson, 409 U.S. at 67, 175 USPQ at 675. "Laws of nature, physical phenomena and abstract ideas" are the only three exclusions recognized by the Federal Circuit. There is no separate exclusion for mathematical algorithms. See Alappat, 33 F.3d at 1543, 31 USPQ2d at 1556 ("[The Supreme Court] never intended to create an overly broad, fourth category of [mathematical] subject matter excluded from § 101."). There is also no "business method" exception. See State Street, 149 F.3d at 1375, 47 USPQ2d at 1602 ("We take this opportunity to lay this ill-conceived ['business method'] exception to rest.").

The judicially recognized exclusions may be understood as tools to ensure that the proper weight be given to both the "whoever invents or discovers any new and useful" phrase and the four statutory categories of "process, machine, manufacture, or composition of matter" of § 101. These phrases are the statutory means by which Congress delimited the Constitutional authorization to promote the progress of the "useful arts" ("technological arts"). The "invents or discovers" requirement excludes subject matter that existed in nature prior to the purported invention, while the statutory categories ensure that patents issue only for practical applications, not "abstract ideas." As stated in Sarkar, 588 F.2d at 1333, 200 USPQ at 137:

Though every set of steps, of whatever nature, may properly be labeled a "process," § 101 ("Whoever invents") limits the patent system to invented processes. Sets of steps conducted entirely by nature are not subject to patenting; they are not invented by man. Sets of steps occurring only in the mind have not been made subject to patenting because mental processes are but disembodied thoughts, whereas inventions which Congress is constitutionally empowered to make patentable are tangible embodiments of ideas in the useful, or technological, arts. See In re Waldbaum, 457 F.2d 997, 1003, 59 Cust. & Pat. App. 940, 173 USPQ 430, 434 (1972) (commenting on the synonymy of useful arts and technological arts).

Mathematical exercises, or methods of calculation, are within the myriad of mental processes of which the human mind is capable. Though they may be represented by written formulae, symbols, equations, or "algorithms," mathematical exercises remain disembodied. They may not, therefore, cross the threshold of § 101. . . .

Thus, a series of steps is a "process" within § 101 unless it falls within a judicially determined category of nonstatutory subject matter exceptions.

See also In re Walter, 618 F.2d 758, 770, 205 USPQ 397, 409 (CCPA 1980) (pure mathematics is not an art or technology).

Laws of nature and physical phenomena

Of the three exceptions, "laws of nature, physical phenomena and abstract ideas," "laws of nature" and "physical phenomena" are not patentable because the discovery of a law of nature, a principle of physical science, or a natural phenomenon is not an invention made by man. "Thus, a new mineral discovered in the earth or a new plant found in the wild is not patentable subject matter. Likewise, Einstein could not patent his celebrated law that $E=mc^2$; nor could Newton have patented his law of gravity. Such discoveries are 'manifestations of ... nature, free to all men and reserved exclusively to none.'" Diamond v. Chakrabarty, 447 U.S. at 309, 206 USPQ at 197 (citing Funk Seed Co. v. Kalo Co., 333 U.S. at 130, 76 USPQ at 281). See also Robinson § 135 ("In one sense, the word 'principle' denotes the physical force employed by an invention. The other appellations given to this force are very numerous, and most of them are wholly inappropriate. It has been called 'an elementary truth,' 'a principle of science,' 'a property of matter,' 'an element of matter,' 'a law of nature,' the root and ground of science;'" It cannot be patented for the three following reasons:): § 136 ("Firstly, a principle, considered as a natural physical force, is not the product of inventive skill."; § 137 ("Secondly, a principle, considered as a natural physical force, is the common property of all mankind."); and § 138 ("Thirdly, a principle, considered as a natural physical force, is not a complete and operative

means."). And, as to living subject matter, Congress recognized that "the relevant distinction was not between living and inanimate things, but between products of nature, whether living or not, and human-made inventions." *Id.* at 313, 206 USPQ at 199. "Laws of nature" and "physical phenomena" may also represent inherent properties, e.g., the discovery that certain plants have a chemoprotective effect against cancer. "Laws of nature" and "physical phenomena" are often expressed using mathematical formula, such as $E=mc^2$. It is arguable that certain mathematical principles describing real world truths, such as the Pythagorean theorem, represent a law of nature as well as an abstract idea.

"Laws of nature" and "physical phenomena," if drafted as such, usually do not fit within a statutory category; e.g., a claim to " $E=mc^2$, where E is energy, m is mass, and c is the speed of light" does not fit the definitions of a "process, machine, manufacture, or composition of matter" because it is neither a series of acts nor a physical thing. Of course, a competent draftsman can always draft "laws of nature" and "physical phenomena" to appear to be in a statutory category, such as a product or process, which is why the exceptions must apply to subject matter that otherwise falls within one of the statutory classes of § 101. *See Sarkar*, 588 F.2d at 1333, 200 USPQ at 137 ("Sets of steps conducted entirely by nature are not subject to patenting; they are not invented by man."); *Smithkline Beecham Corp. v. Apotex Corp.*, 365 F.3d 1306, 1331, 70 USPQ2d 1737, 1756 (Fed. Cir. 2004) (Gajarsa, J., concurring) ("SKB's paroxetine hemihydrate ... can be 'made' through a natural process of spontaneous conversion" and the claim covers a product of a "natural process").

Abstract ideas

"An idea of itself is not patentable, but a new device by which it may be made practically useful is." *Rubber-Tip Pencil Co. v. Howard*, 87 U.S. 498, 507 (1874). *See also Burr v. Duryee*, 68 U.S. at 570 ("We find ... no authority to grant a patent for a 'principle,' or a mode of operation, or an idea, or any other kind of abstraction."). Unlike "laws of nature" and "natural phenomena," "abstract ideas" are conceived by man and can be claimed as methods.

The nature of an "abstract idea" is harder to describe, so I start with some definitions. The term "abstract" is defined as "1. considered apart from concrete existence: an abstract concept. 2. Not applied or practical; theoretical. 3. Not easily understood; abstruse." *The American Heritage Dictionary* (2d ed. Houghton Mifflin Co. 1982). "Idea" is defined as "1. Something that exists in the mind, potentially or actually, as a product of mental activity, such as a thought, image, or conception. 2. An opinion, conviction, or principle 3. A plan, scheme, or method." *Id.* "Practical" is defined as "4. Capable of being used or put into effect; useful: practical knowledge of German.... 6. Concerned with the production or operation of something useful: Woodworking is a practical art." *Id.* "Application" is defined as "3.a. The act of putting something to a

special use or purpose: an application of a new method. b. A specific use to which something is put: the application of science to industry. 4. The capacity of being usable; relevance: Geometry has practical application." Id. "Useful" is defined as "Capable of being used advantageously." Id. Therefore, the "abstract idea" exception refers to disembodied plans, concepts, schemes, or theoretical methods. The opposite of an "abstract idea" is something having a concrete existence, tangible, and put to a practical use. In my opinion, an "abstract idea" is "applied" or "embodied," i.e., it is transformed into a "practical application" or a "concrete and tangible" instantiation, when it is utilized in an invention that is a "process, machine, manufacture, or composition of matter" under § 101. A "machine, manufacture, or composition of matter" covers concrete and tangible "things." A "process" that is tied to a particular machine or apparatus, or that transforms physical subject matter, performs concrete and tangible "acts."

The most well known example of an "abstract idea" is a mathematical algorithm, which is a "procedure for solving a given type of mathematical problem," Diamond v. Diehr, 450 U.S. at 186, 209 USPQ at 9. Mathematical algorithms per se, such as claim 13 in Gottschalk v. Benson, merely recite steps for transforming data (numbers) and are disembodied because they do not recite means (structure) for implementing the steps and because they do not require transformation of physical subject matter, such as electrical signals. Mathematical algorithms can be "abstract ideas" that do not represent a "law of nature" or a "physical phenomenon." See In re Meyer, 688 F.2d 789, 794-95, 215 USPQ 193, 197 (CCPA 1982) ("However, some mathematical algorithms and formulae do not represent scientific principles or laws of nature; they represent ideas or mental processes and are simply logical vehicles for communicating possible solutions to complex problems."). Importantly, "abstract ideas" are not limited to mathematical subject matter: any series of steps that, as claimed, is not physically embodied is an "abstract idea."

"Abstract ideas," if drafted as such, do not fall within a statutory category; e.g., a claim in the form "I claim the relationship $a^2 + b^2 = c^2$, where a and b are length of the legs of a right angle triangle and c is the length of the hypotenuse," does not fit the definitions of a "process, machine, manufacture, or composition of matter" because it is neither a series of acts nor a physical thing. Of course, a competent draftsman can always draft an "abstract idea" to appear to be in a statutory category, which is why the exception must apply to subject matter that otherwise falls within one of the statutory classes of § 101. Claims that qualify under § 101 as a "machine, manufacture, and composition of matter," or under § 100(b) as a "process" involving the use of a known machine, manufacture, or composition of matter, generally do not pose statutory subject matter problems because physical structure is not an abstract idea. Transformation of data by a machine is a special case which will be discussed later in connection with State Street. The main problem is that "abstract ideas," such as mathematical algorithms, and other kinds of subject matter which do not appear to the USPTO to be included within the "useful arts" of the Constitution, are easily and

naturally drafted as a series of steps, which fits the dictionary definition of a process. In my opinion, not all processes in the dictionary sense are statutory "processes" under § 101. The definition of a statutory "process" in Cochrane v. Deener requires a transformation of physical subject matter to a different state or thing. A series of steps which meets the definition of a statutory "process" is not an "abstract idea" because of the concrete, physical acts. Since a "process" is not required to recite the means (structure) to perform the steps, claims often do not recite how the steps are implemented, which can make it difficult to determine whether the subject matter is a statutory "process" or an "abstract idea."

A claim that covers ("preempts") any and every possible way that the steps can be performed is a disembodied "abstract idea" because it recites no particular implementation of the idea (even if one is disclosed). For example, in discussing the mathematical algorithm in Gottschalk v. Benson, the Supreme Court discussed the cases holding that a principle, in the abstract, cannot be patented and then stated:

Here the "process" claim is so abstract and sweeping as to cover both known and unknown uses of the BCD to pure binary conversion. The end use may ... be performed through any existing machinery or future-devised machinery or without any apparatus.

409 U.S. at 68, 175 USPQ at 675. There is also concern that the scope of the claim is not commensurate with the scope of enablement. See also O'Reilly v. Morse, 56 U.S. 62 (1854) (Morse's eighth claim to use of electric or galvanic current for marking or printing intelligible characters, signs, or letters at a distance broader than the description in the specification).

Incidental physical limitations, such as data gathering, field of use limitations, and post-solution activity are not enough to convert a "abstract idea" into a statutory "process." See "Incidental physical limitations," infra. Some aspects of the "abstract idea" exception have not been explored by the courts. For example, it seems possible that some subject matter technically may not be an "abstract idea" because it requires actions, e.g., "negotiating a contract," but may not qualify as a "process" because the actions do not transform physical subject matter and, so, do not involve any kind of "technology." For this reason, the nonstatutory subject matter analysis under the transformation definition of a statutory "process" is best treated as independent from the "abstract idea" exception.

Two different views of exclusions

Exclusions have been thought of in two ways: as exceptions and as exclusions.

In the more useful and more common meaning, exceptions refer to subject matter which would be within one of the four categories, as drafted, "but for" some

exceptional condition, i.e., they take out subject matter that would otherwise be included. See Sarkar, 588 F.2d at 1333, 200 USPQ at 137 ("a series of steps is a 'process' within § 101 unless it falls within a judicially determined category of nonstatutory subject matter exceptions"); Pardo, 684 F.2d at 916, 214 USPQ at 677 ("any process, machine, manufacture, or composition of matter constitutes statutory subject matter unless it falls within a judicially determined exception to section 101"); State Street, 149 F.3d at 1375 n.9, 47 USPQ2d at 1602 n.9 ("Of course, the subject matter must fall into at least one category of statutory subject matter [before determining whether it encompasses statutory subject matter.]). This meaning of an exception accounts for the fact that a competent draftsman can readily draft a claim to appear to be within one of the four categories of § 101.

The less useful characterization is that exclusions represent subject matter that is excluded by the terms of § 101. See Alappat, 33 F.3d at 1553 n.13, 31 USPQ2d at 1565 n.13 (Archer, C.J., concurring in part and dissenting in part) ("It is erroneous therefore to characterize, as the majority does, nonstatutory subject matter such as a mathematical algorithm as an "exception" to § 101. Defining patentable subject matter is the raison d'être of § 101."). "Laws of nature, physical phenomena and abstract ideas," if drafted as such (e.g., "I claim $E=mc^2$ "), do not fit within any of the statutory definitions because they do not have structure, as required by a "machine, manufacture, or composition of matter," and are not a series of steps, as required by a "process." Or, a claim to a series of steps might fit the dictionary definition of a process, but might be excluded from § 101 because it does not meet the definition of a statutory "process" as requiring a physical transformation of physical subject matter.

In my opinion, it is more correct that exclusions refer to subject matter that would otherwise be within one of the categories of § 101. Subject matter which does not fall within one of the categories of § 101 is nonstatutory for that reason and one does not need to get to the exceptions.

Machines and machine-implemented processes: The Federal Circuit's test in State Street Bank and AT&T

Pre-State Street

It is beyond the scope of this opinion to provide a comprehensive history of § 101. The Supreme Court cases of Parker v. Flook and Diamond v. Diehr are analyzed at length in the literature. See, e.g., 1 Patents § 1.03[6]. I focus primarily on certain § 101 issues as they developed in the Court of Customs and Patent Appeals (CCPA) and the Federal Circuit.

Early statutory subject matter issues were addressed under the "mental steps" doctrine, the "function of a machine" doctrine, or under the "method of doing business" exception. Although several cases discuss a "method of doing business" exception, no

cases were ever held unpatentable on this basis. See State Street, 149 F.3d at 1375, 47 USPQ2d at 1603 ("The business method exception has never been invoked by this court, or the CCPA, to deem an invention unpatentable."). The "function of a machine" doctrine, which was applied to deny a process claim where the steps described the inherent function of the disclosed apparatus, was overruled in Tarczy-Hornoch. "The mental-steps doctrine was based upon the familiar principle that a scientific concept or mere idea cannot be the subject of a valid patent. The doctrine was regularly invoked to deny patents to inventions consisting primarily of mathematical formulae or methods of computation." (Citations and footnotes omitted.) Diamond v. Diehr, 450 U.S. at 195, 209 USPQ at 12 (Stevens, J., dissenting). Claims that were broad enough to cover being performed by a human using his mind, although they were capable of being performed by a machine, were rejected under the "mental steps" doctrine; see "Claims read on nonstatutory and statutory subject matter," infra. The CCPA held that claims limited to machines and machine-implemented processes were patentable subject matter, i.e., they were not subject to rejection under the "mental steps" theory. See In re Bernhart, 417 F.2d 1395, 163 USPQ 611 (CCPA 1969) (machine claims and machine-implemented process claims do not fall within the "mental steps" exclusion); In re Mahoney, 421 F.2d 742, 745, 164 USPQ 572, 575 (CCPA 1970) (§ 112, second paragraph, and § 101 "mental steps" rejections overcome since the claims are limited to a machine implementation and "since the machine-implemented process is clearly statutory."). The "mental steps" doctrine was in effect overruled in Musgrave, by limiting mental steps to steps incapable of being performed by a machine or apparatus. See Musgrave, 431 F.2d at 889-90 and 889 n.4, 167 USPQ 287 & 287 n.4.

A rejection based on "mental steps" and "mathematical steps" was reversed in In re Benson, 441 F.2d at 687 & 688, 169 USPQ at 552 & 553 ("Claim 8 is for a method to be practiced in part on particular apparatus specified to be a 'reentrant shift register' and did not include coverage of the process implemented by the human mind. Claim 13, which could be carried out with hardware or manually, was said to have no practical use other than the more effective operation of a digital computer, which was in the 'technological arts.'"). Certiorari was granted and the Supreme Court reversed. Gottschalk v. Benson, 409 U.S. 63, 175 USPQ 673. The Court stated that "[t]he patent sought is on a method of programming a general-purpose digital computer to [solve a mathematical algorithm]," 409 U.S. at 65, 175 USPQ at 674, and, thus, recast the statutory subject matter issue in terms of mathematical algorithms or abstract ideas, instead of the "mental steps" doctrine. Legal writers have noted at least five possible explanations for the holding. See, e.g., 1 Patents § 1.03[6][c]. Three of the reasons remain particularly relevant to process claims. First, the mathematical algorithm was to a principle, in the abstract, or a mental process, which "are not patentable, as they are the basic tools of scientific and technological work." Gottschalk v. Benson, 409 U.S. at 67, 175 USPQ at 675. The Court stated: "The conversion of BCD numerals to pure binary numerals can be done mentally The mathematical procedures can be carried out in existing computers long in use, no new machinery being necessary. And, as noted, they can also be performed without a computer." (Emphasis added.) Id. at 67,

175 USPQ at 675. The Court noted that "the 'process' claim is so abstract and sweeping as to cover both known and unknown uses ... [and] be performed through any existing machinery or future-devised machinery or without any apparatus" (emphasis added), id. at 68, 175 USPQ at 675. This is considered a second reason in 1 Patents § 1.03[6][c], but I consider it part of the first reason related to claim breadth. The fact that the claims that are so broad as to read on being performed mentally (nonstatutory subject matter) as well as by a machine (possibly statutory subject matter) are nonstatutory is implicitly the "mental steps" doctrine. See section entitled "Claims that read on statutory and nonstatutory subject matter are unpatentable," infra; Diamond v. Diehr, 450 U.S. at 201 n.18, 209 USPQ at 14 n.18 (Stevens, J., dissenting) (commentators have suggested that the Court implicitly relied upon the mental steps doctrine and that the analysis in Benson was entirely consistent with the mental steps doctrine). The more accepted terminology today is that the claim is so broad that it is an "abstract idea" rather than "mental steps." The Court did not comment on the fact that claim 8 contained the structure of a "reentrant shift register," an element of all general purpose digital computers, whereas claim 13 did not recite any machine. Claim 8 is the reason why machine-implemented mathematical algorithms were subsequently held to be nonstatutory.

Second, the method did not transform or reduce subject matter to a different state or thing. The Supreme Court stated that "[t]ransformation and reduction of an article 'to a different state or thing' is the clue to patentability of a process claim that does not include particular machines," 409 U.S. at 70, 175 USPQ at 676. As noted in Schrader, 22 F.3d at 295, 30 UPSQ2d at 1459-60, the statement in Gottschalk v. Benson is imperfect because the subject matter transformed is not limited to objects and substances. Nevertheless, claim 13 clearly recites no structure and does not transform any physical subject matter, tangible or intangible; it only operates on binary coded decimal numbers. The fact that there is no physical transformation supports the first reason that the claims are so broad that they are directed to directed to an abstract idea rather than a practical application thereof.

Third, the Court stated the following "nutshell":

It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting BCD numerals to pure binary numerals were patented in this case. The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.

Gottschalk v. Benson, 409 U.S. at 71-72, 175 USPQ at 676. I view this as related to the first point, that one cannot patent a principle or abstract idea, and that where a claim is so broad that it covers every "substantial practical application," this is "in

practical effect would be a patent on the [abstract idea] itself" that would "preempt" others from using the principle. The Court seems to say that performing a mathematical algorithm on a digital computer could preempt every "substantial practical application." Thus, the fact that claim 8 was directed to a method performed on a computer, and not the mathematical algorithm per se as in claim 13, did not make it statutory.

Thus, Gottschalk v. Benson can be explained in terms of (1) the claims being so broad as to read on an abstract idea ("mental steps") as well as on a machine-implemented method; (2) the claims not meeting the transformation definition of a process; and (3) the claims, even if performed on a machine, were so broad as to cover every "substantial practical application" and "in practical effect would be a patent on the [abstract idea] itself." The Court did not hold that the claims were unpatentable because they covered a computer program.

Because claim 8 in Benson contained a "reentrant shift register," it was considered that machine-implemented processes would be nonstatutory if "patenting the 'machine process' in practical effect would be a patent on the algorithm itself." In re Waldbaum (Waldbaum II), 559 F.2d 611, 616, 194 USPQ 465, 469 (CCPA 1977). Most claims in the subsequent cases recited machine apparatus claims and machine-implemented process claims, probably because pre-Gottschalk v. Benson case law held that such claims were patentable subject matter. The CCPA held that if the claim was directed essentially to a mathematical algorithm, even if the solution is for a specific purpose and was performed on a machine, the method was nonstatutory. See In re Christensen, 478 F.2d 1392, 178 USPQ 35 (CCPA 1973) (method of determining the porosity of subsurface formations in situ using mathematical formula held nonstatutory); Waldbaum II (method of operating a data processor using specific machine steps to calculate the relative numbers of 0s and 1s in a data word held nonstatutory); In re Richman, 563 F.2d 1026, 195 USPQ 340 (CCPA 1977) (method of calculating an airborne radar boresight correction angle based using actual terrain measurements in a radar held nonstatutory); In re de Castelet, 562 F.2d 1236, 1244, 195 USPQ 439, 446 (CCPA 1977) (machine method of generating a curve from data supplied to a computer for controlling a numerical control system type model forming means, including steps of "transforming the electrical signals" and "transmitting electrical signals ... from said computer to said model forming means," held nonstatutory: "We think the instant claims recite a process for solving a set of mathematical equations per se, the solution being a set of points along a curve, and not a process which merely uses equation solutions as one step in achieving some result other than solution of the equations."). Claims which only used the results of mathematical algorithms and did not include the mathematical algorithms itself were held to be statutory subject matter. See In re Deutsch, 553 F.2d 689, 692, 193 USPQ 645, 648 (CCPA 1977) ("Unlike the abandoned claims, which included formulae and algorithms, the claims on appeal are drawn to system-operated methods in which system control is applied at less frequent intervals than those at which

individual plant controls are applied.... Thus, the claimed invention lies in the timing and sequencing of control application, not in the control means ('[mathematical] optimization technique') itself."); Chatfield, 545 F.2d at 158, 191 USPQ at 736 ("Chatfield's independent claims contain neither a mathematical formula nor a mathematical algorithm. Mathematical algorithms appear only in the dependent claims and do not themselves constitute the method per se.").

The application of Gottschalk v. Benson was initially considered to be limited to method claims. See In re Noll, 545 F.2d 141, 149, 191 USPQ 721, 727 (CCPA 1976) ("We conclude that Benson must be limited to method claims such as those presented in that case."). Practitioners started drafting claims in means-plus-function format as apparatus claims to avoid a mathematical algorithm rejection. Eventually, in In re Freeman, 573 F.2d 1237, 197 USPQ 464 (CCPA 1978), the CCPA adopted Judge Rich's viewpoint (based on a line of dissenting opinions) that the form of the claim is often an exercise in drafting and is not determinative. See In re Johnson, 589 F.2d 1070, 1077, 200 USPQ 199, 206 (CCPA 1978) ("[Judge Rich's] viewpoint was adopted by this entire Court in In re Freeman"); Diamond v. Diehr, 450 U.S. at 202-03, 209 USPQ at 14-15 (Steven, J., et al. dissenting) (discussing dissenting opinions below). However, to the best of my knowledge, only apparatus claims in means-plus-function format were ever held to be nonstatutory subject matter. Under the interpretation of 35 U.S.C. § 112, last paragraph, that was applied by the PTO (and, it seems, by the CCPA) at the time, means-plus-function limitations in ex parte prosecution were broadly construed to cover any and every means for performing the function and, thus, claims in "means for" format were considered equivalent to a process. See Freeman, 573 F.2d at 1247, 197 USPQ at 472 ("[I]f allowance of a method claim is proscribed by Benson, it would be anomalous to grant a claim to apparatus encompassing any and every 'means for' practicing that very method."); In re Maucorps, 609 F.2d 481, 486, 203 USPQ 812, 816 (CCPA 1979) ("As admitted by appellant at oral argument, method claims drawn to the steps performed by appellant's 'means' would be non-statutory and an attempt to claim appellant's algorithms in their application to a model of a sale organization.... That 35 U.S.C. § 112 authorizes the claiming of 'means for' performing a function cannot rescue appellant's claims from the requirements of § 101, because § 112 does not authorize the claiming of apparatus entirely in terms of 'means for' performing a non-statutory method."); In re Sherwood, 613 F.2d 809, 817 n.9, 204 USPQ 537, 545 n.9 (CCPA 1980) ("In Freeman, for the purpose of testing compliance with § 101, process and 'means for' claims were treated in the same manner. We do the same here."); Walter, 618 F.2d at 768, 205 USPQ at 408 (discussion of "The 'Means For' Apparatus Claims"); Pardo, 684 F.2d at 916 n.6, 214 USPQ at 677 n.6; In re Abele, 684 F.2d 902, 909, 214 USPQ 682, 688 (CCPA 1982) ("[W]e see no basis for treating [appellants'] apparatus claims [in 'means for' format] differently from their method claims."); and Meyer, 688 F.2d at 795 n.3, 215 USPQ at 198 n.3. The structure corresponding to the means limitations in all these cases was apparently a general purpose computer. The PTO's treatment of claims in means-plus-function format as process claims was criticized in Iwahashi, 888 F.2d at

1375 n.1, 12 USPQ2d at 1912 n.1 and Alappat, 33 F.3d at 1545 n.25, 31 USPQ2d at 1558 n.25, and the district court's treatment of claims in means-plus-function format as process claims was found to be error in State Street, 149 F.3d at 1371, 47 USPQ2d at 1599; however, the Federal Circuit in these three cases did not mention, distinguish, or overrule the similar treatment in Freeman, Maucorps, Sherwood, Walter, Pardo, Abele, and Meyer.

Starting with Freeman, the CCPA developed a more formal two-part test for statutory subject matter which eventually became known as the Freeman-Walter-Abele test, referring to the test in Freeman, as modified by Walter and Abele. Step one of the two-part test was to determine whether a mathematical algorithm was present. Step two was eventually modified to require "no more than that the algorithm be 'applied in any manner to physical elements or process steps,' provided that its application is circumscribed by more than a field of use limitation or non-essential post-solution activity. Thus, if the claim would be 'otherwise statutory,' albeit inoperative or less useful without the algorithm, the claim likewise presents statutory subject matter when the algorithm is included." (Citation omitted.) Abele, 684 F.2d at 907, 214 USPQ at 686. If no mathematical algorithm was present, it was not necessary to get to the second step, and the subject matter was statutory. See Freeman, 573 F.2d at 1246, 197 USPQ at 471 (Using a computer to typeset alphanumeric information: "The method claims here at issue do not recite process steps which are themselves mathematical calculations, formulae, or equations."); In re Toma, 575 F.2d 872, 877, 197 USPQ 852, 856-57 (CCPA 1978) ("Translating between natural languages is not a mathematical problem as we understand the term to have been used in Benson."); In re Phillips, 608 F.2d 879, 883, 203 USPQ 971, 975 (CCPA 1979) ("Our analysis of the claims on appeal reveals no recitation, directly or indirectly, of an algorithm in the Benson and Flook sense."); Pardo, 684 F.2d at 916, 214 USPQ at 676 ("Applying the first part of the Freeman analysis to the appealed claims, we are unable to find any mathematical formula, calculation, or algorithm either directly or indirectly recited in the claimed steps of examining, compiling, storing, and executing."). It was not always easy to determine whether the claim directly or indirectly recited a mathematical algorithm.

Once a mathematical algorithm was found, directly or indirectly, the second part of the test was applied. These cases illustrate the difficulty in defining a statutory process. Several cases find statutory subject matter based on the physical transformation of tangible materials or intangible electrical signals representing a physical thing. See Johnson, 589 F.2d 1070, 200 USPQ 199 (claims reciting methods for producing an output trace which is different from, and an enhancement of, an input seismic trace were statutory); Sherwood, 613 F.2d at 819, 204 USPQ at 546 ("The claimed invention, contrary to the solicitor's arguments, converts one physical thing into another physical thing just as any other electrical circuitry would do."); Diamond v. Diehr, 450 U.S. at 192-93, 209 USPQ at 10 ("That respondent's claims involve the transformation of an article, in this case raw, uncured synthetic rubber, into a different

state or thing cannot be disputed.... Industrial processes such as this are the types which have historically been eligible to receive the protection of our patent laws."); In re Taner, 681 F.2d 787, 790, 214 USPQ 678, 681 (CCPA 1982) ("Appellants' claimed process involves the taking of substantially spherical seismic signals obtained in conventional seismic exploration and converting ('simulating from') those signals into another form, i.e., into a form representing the earth's response to cylindrical or plane waves. Thus the claims set forth a process and are statutory within § 101."); Abele, 684 F.2d 902, 214 USPQ 682 (claim 5 directed to calculation of number and display of the result was nonstatutory, whereas claim 6, which depended from claim 5 and stated that the data was "X-ray attenuation data produced in a two dimensional field by a computer tomography scanner," was statutory because it required a CAT-scan process); Arrhythmia Research Tech., Inc. v. Corazonix Corp., 958 F.2d 1053, 1059, 22 USPQ2d 1033, 1038 (Fed. Cir. 1992) ("These claimed steps of 'converting', 'applying', 'determining', and 'comparing' are physical process steps that transform one physical electrical signal into another. The view that 'there is nothing necessarily physical about 'signals' is incorrect.").

Other cases find no physical steps or that the physical steps were insufficient to define statutory subject matter. See In re Gelnovatch, 595 F.2d 32, 41-42, 201 USPQ 136, 145 (CCPA 1979) (claims to a "computer method": "But, where, as here, the claims solely recite a method whereby a set of numbers is computed from a different set of numbers by merely performing a series of mathematical computations, the claims do not set forth a statutory process."); Sarkar, 588 F.2d at 1335, 200 USPQ at 139 (physical step of measuring the channel dimensions at specifically chosen distance intervals along the length of the channel treated as formula-dictated "data gathering" step and does not establish that the claimed invention as a whole is an application of the mathematical algorithm); Maucorps, 609 F.2d 481, 203 USPQ 812 (computer-implemented model of a sales organization in means-plus-function format nonstatutory); Meyer, 688 F.2d at 796, 215 USPQ at 199 ("[A]ppellants' independent claims [process and means-plus-function format] are to a mathematical algorithm representing a mental process that has not been applied to physical elements or process steps and is, therefore, not limited to any otherwise statutory process, machine, manufacture, or composition of matter."); Grams, 888 F.2d 835, 12 USPQ2d 1824 (Fed. Cir. 1989) (method of diagnosing an abnormal condition in an individual nonstatutory; step of performing clinical tests on individuals to obtain data did not convert it to a statutory process); Schrader, 22 F.3d 290, 30 USPQ2d 1455 (method of bidding on a plurality of related items; the step of entering of bids in a "record" did not convert it to a statutory process); and Warmerdam, 33 F.3d at 1359-60, 31 USPQ2d at 1758-59 (method of generating a data structure representing the shape of a physical object; the argument that the claims were broad enough to cover methods which involve physically, instead of mathematically, locating the medial axis of the object was not persuasive). Thus, it was clear that an apparatus claim (in means-plus-function format) and a machine-implemented process claim were not statutory subject matter just because of the presence of a machine.

In Alappat, the Federal Circuit addressed the issue of statutory subject matter of claims in means-plus-function format under 35 U.S.C. § 112, sixth paragraph. Alappat noted that, as explained in In re Donaldson Co., 16 F.3d 1189, 1193, 29 USPQ2d 1845, 1848-49 (Fed. Cir. 1994) (en banc), the USPTO must construe claim elements expressed in means-plus-function terms under 35 U.S.C. § 112, sixth paragraph, to cover the corresponding structure, material, or acts described in the specification, and equivalents thereof, to the extent that the specification provides such disclosure. The court held that the Board majority erred as a matter of law in refusing to apply § 112, sixth paragraph, in the § 101 determination. The court held that the claim in means-plus-function format read on the specific circuits in the disclosure and was a machine, which produced a "useful, concrete, and tangible result," and, therefore, was statutory subject matter. The court did not mention Freeman, Maucorps, Sherwood, Walter, Pardo, Abele, and Meyer, relied upon by the Board majority, in which claims in means-plus-function format were treated as process claims. As discussed in the section "Claims read on statutory and nonstatutory subject matter," *infra*, the court mooted the issue of whether the claim was nonstatutory because it was broad enough to cover both nonstatutory subject matter (performing the functions with a general purpose computer) and statutory subject matter (the specific disclosed circuit), by holding that a programmed general purpose computer is a statutory apparatus.

After Alappat, the USPTO issued Examination Guidelines for Computer-Related Inventions (Guidelines) 1184 Off. Gaz. Pat. & Trademark Office 87 (March 26, 1996), which were incorporated into the Manual of Patent Examining Procedure (MPEP) § 2106 (6th ed., Rev. 3, July 1997). The Guidelines have been revised to reflect subsequent decisions in State Street and AT&T. See MPEP § 2106 (8th ed., Rev. 1, February 2003).

Different aspects of the history of statutory subject matter and computer-implemented mathematical algorithms are discussed in Diamond v. Diehr, 450 U.S. at 193-205 (Stevens, J., dissenting), AT&T, 172 F.3d at 1356 & 1356 n.3, 50 USPQ2d at 1450 & 1450 n.3, and Patentable Subject Matter, 1106 Off. Gaz. Pat. & Trademark Office 5 (September 5, 1989).

Thus, before State Street, the CCPA and the Federal Circuit addressed and settled many difficult issues involving computers and mathematical algorithms. Claims were not nonstatutory just because they covered a computer program performed on a general purpose digital computer. Mathematical algorithms did not have to preempt every possible use to be nonstatutory; it was sufficient that the claim was to a mathematical algorithm. Mathematical algorithms did not become statutory subject matter just because they were performed on a machine. The proper analysis for statutory subject matter was held to be based on the subject matter as a whole; the "point of novelty" approach was abandoned. The court addressed different types of mathematical algorithms and ways the algorithms were directly or indirectly claimed.

The presence of various physical steps attached to the mathematical algorithm, such as data gathering, field of use limitations, and post-solution activity did not necessarily convert the claim into statutory subject matter. A number of cases focused on the transformation aspect of transforming electrical signals as an indicia of a statutory process. However, nonstatutory subject matter under § 101 was always a difficult issue to address because it was difficult to determine whether a mathematical algorithm was present and whether a process was otherwise statutory.

State Street and AT&T involved machines

The Federal Circuit addressed the issue of statutory subject matter in connection with machine-implemented mathematical algorithms and the "abstract idea" exception. It stated that "certain types of mathematical subject matter, standing alone, represent nothing more than abstract ideas until reduced to some type of practical application, i.e., 'a useful, concrete and tangible result.'" State Street, 149 F.3d at 1373, 47 USPQ2d at 1600-01 (citing Alappat, 33 F.3d at 1544, 31 USPQ2d at 1557). "[T]he Alappat inquiry simply requires an examination of the contested claims to see if the claimed subject matter as a whole is a disembodied mathematical concept representing nothing more than a 'law of nature' or an 'abstract idea,' or if the mathematical concept has been reduced to some practical application rendering it 'useful.'" AT&T, 172 F.3d at 1357, 50 USPQ2d at 1451. "[O]ur inquiry here focuses on whether the mathematical algorithm is applied in a practical manner to produce a useful result." Id. at 1360, 50 USPQ2d at 1453.

The terms in the "practical application, i.e., 'a useful, concrete and tangible result'" test were not defined. Some guidance on how to determine whether subject matter produces a "practical application, i.e., 'a useful, concrete and tangible result'" can be gleaned from the four examples discussed in State Street and AT&T. The examples share at least three characteristics: (1) the claimed transformation of data was by a machine (e.g., a computer), which is consistent with the origin of the test in Alappat, 33 F.3d at 1544, 31 USPQ2d at 1557 ("This is not a disembodied mathematical concept which may be characterized as an 'abstract idea,' but rather a specific machine to produce a useful, concrete, and tangible result." (Emphasis added.)); (2) the data being transformed by the machine corresponded to something in the "real world," i.e., it was representative of physical activity or objects, not just a number--the nature of the data indicates the algorithm is applied in a "useful" way; and (3) no physical transformation or control took place outside of the machine, i.e., the "useful result" was expressed as a number in the machine. As stated in State Street, 149 F.3d at 1373, 47 USPQ2d at 1601:

Unpatentable mathematical algorithms are identifiable by showing they are merely abstract ideas constituting disembodied concepts or truths that are not "useful." From a practical standpoint, this means that the algorithm must be applied in a "useful" way. In Alappat, we held that data, transformed by a

machine through a series of mathematical calculations to produce a smooth waveform display on a rasterizer monitor, constituted a practical application of an abstract idea (a mathematical algorithm, formula, or calculation), because it produced "a useful, concrete and tangible result" – the smooth waveform.

Similarly, in Arrhythmia Research Technology Inc. v. Corazonix Corp., 958 F.2d 1053, 22 USPQ2d 1033 (Fed. Cir. 1992), we held that the transformation of electrocardiograph signals from a patient's heartbeat by a machine through a series of mathematical calculations constituted a practical application of an abstract idea (a mathematical algorithm, formula, or calculation), because it corresponded to a useful, concrete or tangible thing – the condition of a patient's heart.

Today, we hold that the transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces "a useful, concrete and tangible result" – a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades. [Emphasis added.]

These refer to holdings of the cases, so the machine element cannot be dismissed. Note that nothing was done with the computed data outside of the machine. In Alappat, illumination intensity data was output "to be displayed on a display means," an intended use, but no actual display step was claimed. In Arrhythmia, the last step or function was comparing to determine the presence of high frequency energy in the late QRS signal. In State Street, no external use of the processed data was recited.

In AT&T, dealing with a "method for use in a telecommunications system in which interexchange calls initiated by each subscriber are automatically routed over the facilities of a particular one of a plurality of interexchange carriers associated with that subscriber," the Federal Circuit described the district court's conclusion as follows, 172 F.3d at 1355, 50 USPQ2d at 1449:

The district court concluded that the method claims of the '184 patent implicitly recite a mathematical algorithm. The court was of the view that the only physical step in the claims involves data-gathering for the algorithm. Though the court recognized that the claims require the use of switches and computers, it nevertheless concluded that use of such facilities to perform a non-substantive change in the data's format could not serve to convert non-patentable subject matter into patentable subject matter. Thus the trial court, on summary judgment, held all of the method claims at issue invalid for failure to qualify as statutory subject matter. [Citations omitted.] [Emphasis added.]

The Federal Circuit stated, 172 F.3d at 1358, 50 USPQ2d at 1452:

As previously explained, AT&T's claimed process employs subscribers' and call recipients' PICs as data, applies Boolean algebra to those data to determine the value of the PIC indicator, and applies that value through switching and recording mechanisms to create a signal useful for billing purposes. . . .

. . . It is clear from the written description of the '184 patent that AT&T is only claiming a process that uses the Boolean principle in order to determine the value of the PIC indicator. The PIC indicator represents information about the call recipients's PIC, a useful, non-abstract result that facilitates differential billing of long-distance calls made by an IXC's subscriber. Because the claimed process applies the Boolean principle to produce a useful, concrete, tangible result without pre-empting other uses of the mathematical principle, on its face the claimed process comfortably falls within the scope of § 101. [Emphasis added.]

Although I am aware of arguments in other cases before the Board that the claims in AT&T did not require a machine, I conclude that the court in AT&T interpreted the claims to be a machine-implemented process. Thus, according to AT&T, transformation of data by a process implemented on a machine constitutes a practical application because a PIC indicator represents information about the call recipient's PIC, a useful, non-abstract result that facilitates differential billing of long-distance calls made by an IXC's subscriber.

The court did not hold or suggest that transformation of data without a machine is statutory subject matter depending on what the data represents. Importantly, the court did not hold that mere transformation of data by a machine is sufficient to establish statutory subject matter: it required a "practical application, i.e., 'a useful, concrete and tangible result.'" This is consistent with cases which hold that a mathematical method performed on a computer is not necessarily statutory. See Gottschalk v. Benson (claim 8 to "method of converting signals from binary coded decimal form into binary" on a machine (evidenced by the "reentrant shift register") was not a "process" under 35 U.S.C. §§ 100(b) and 101); Waldbaum II (method of operating a data processor); Gelnovatch (a computer method); Maucorps (a computing system); Alappat, 33 F.3d at 1567, 31 USPQ2d at 1577 (Archer, C.J., concurring in part and dissenting in part) ("[A] claim formally to a general purpose computer running a certain program cannot be deemed to satisfy § 101 simply because the computer is a physical, tangible device."). The presence of a machine was important in both State Street and AT&T. This is consistent with earlier cases, such as Abele, 684 F.2d at 908, 214 USPQ at 687 (claim 5 directed to calculation of number and display of the result was nonstatutory, whereas claim 6, which depended from claim 5, and which stated that the data was "X-ray attenuation data produced in a two dimensional field by a computer

tomography scanner," was statutory subject matter because it required a CAT-scan process).

It appears that one instance where subject matter would not be statutory under the State Street test is a machine claim or machine-implemented process claim to a mathematical algorithm operating on numbers which do not represent any physical activity or thing, such as a new way of calculating a discrete cosine transform on a general purpose digital computer. I reason that the subject matter produces a "concrete and tangible result" because a machine is physical and transforms physical electrical signals, but it does not produce a "useful result" because the data does not correspond to anything in the real world (i.e., the mathematical algorithm is not applied).

So far there are no examples of subject matter being held to be nonstatutory under the State Street/AT&T test. In Bonczyk, 10 Fed. Appx. 908, the Federal Circuit held that a "fabricated energy structure" was nonstatutory as not corresponding to any statutory category of subject matter and did not apply the State Street test. In AT&T, the court noted that the earlier cases of Grams, Schrader, and Warmerdam did not ascertain whether the end result was useful, concrete, and tangible, but did not speculate whether the claimed subject matter would have been nonstatutory under the new test. See AT&T, 172 F.3d at 1360, 50 USPQ2d at 1453. It is noted, however, that none of the claims rejected under § 101 in Grams, Schrader, or Warmerdam recited a machine or machine-implemented process and, thus, would presumably not fall within the State Street test.

Other discussion

Other discussion in State Street and AT&T is informative.

The Federal Circuit made it clear that "laws of nature, physical phenomena and abstract ideas" are the only recognized exceptions. "[The Supreme Court] never intended to create an overly broad, fourth category of [mathematical] subject matter excluded from § 101." AT&T, 172 F.3d at 1357, 50 USPQ2d at 1451, quoting, Alappat, 33 F.3d at 1543, 31 USPQ2d at 1556. That is, mathematical algorithms per se are "abstract ideas." There is also no "business method" exception. See State Street, 149 F.3d at 1375, 47 USPQ2d at 1602 ("We take this opportunity to lay this ill-conceived ['business method'] exception to rest."). Of course, subject matter has to be within one of the categories of § 101 before the question of an exception arises. In my opinion, a claim to a series of steps may be nonstatutory if it does not fall within the definition of a "process" under § 101 because it does not meet the definition of transforming physical subject matter to a different state, in which case it is not necessary to also show that the subject matter falls within an exception or that it does not meet the State Street test.

The Federal Circuit also effectively marginalized the Freeman-Walter-Abele test for statutory subject matter, stating:

After Diehr and Chakrabarty, the Freeman-Walter-Abele test has little, if any, applicability to determining the presence of statutory subject matter. As we pointed out in Alappat, 33 F.3d at 1543, 31 USPQ2d at 1557, application of the test could be misleading, because a process, machine, manufacture, or composition of matter employing a law of nature, natural phenomenon, or abstract idea is patentable subject matter even though a law of nature, natural phenomenon, or abstract idea would not, by itself, be entitled to such protection.

State Street, 149 F.3d at 1374, 47 USPQ2d at 1601. See also AT&T, 172 F.3d at 1359, 50 USPQ2d at 1453:

Although our en banc Alappat decision called this [Freeman-Walter-Abele] test "not an improper analysis," we then pointed out that "the ultimate issue always has been whether the claim as a whole is drawn to statutory subject matter." 33 F.3d at 1543 n.21, 31 USPQ2d at 1557 n.21. Furthermore, our recent State Street decision questioned the continued viability of the Freeman-Walter-Abele test, noting that "[a]fter Diehr and Chakrabarty, the Freeman-Walter-Abele test has little, if any, applicability to determining the presence of statutory subject matter."

It is not clear why the Federal Circuit considers the two-part test to have little applicability after Diamond v. Diehr since the two-part test is completely consistent with the last sentence from the following discussion in Diamond v. Diehr, 450 U.S. at 191-92, 209 USPQ at 10:

We recognize, of course, that when a claim recites a mathematical formula (or scientific principle or phenomenon of nature), an inquiry must be made into whether the claim is seeking patent protection for that formula in the abstract. A mathematical formula as such is not accorded the protection of our patent laws, Gottschalk v. Benson, and this principle cannot be circumvented by attempting to limit the use of the formula to a particular technological environment, Parker v. Flook. Similarly, insignificant post-solution activity will not transform an unpatentable principle into a patentable process. To hold otherwise would allow a competent draftsman to evade the recognized limitations on the type of subject matter eligible for patent protection. On the other hand, when a claim containing a mathematical formula implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (e.g., transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101. [Footnote omitted.] [Citations omitted.]

The Federal Circuit's stated reason is that the application of the test could be misleading, because a process, machine, manufacture, or composition of matter employing a law of nature, natural phenomenon, or abstract idea is patentable subject matter even though a law of nature, natural phenomenon, or abstract idea would not, by itself, be entitled to such protection. However, the inquiry of whether the claimed subject matter is "otherwise statutory" is the second part of the test. There are reasons why the court may want to get away from the two-part test. It has always been difficult to define a "mathematical algorithm" and to determine the presence of a mathematical algorithm in the claim under the first part of the test, as discussed in Judge Rader's concurrence in Arrhythmia. It is analytically simpler to address the "ultimate question" of whether the claimed subject matter as a whole is "otherwise statutory" under the second part of the test, without trying to identify the presence of subject matter which would be nonstatutory if claimed by itself. See Alappat, 33 F.3d at 1543 n.21, 31 USPQ2d 1557 n.21 ("[E]ven in those cases where the courts have applied a variant of the two-part analysis of [Freeman and Walter] ... the ultimate issue always has been whether the claim as a whole is drawn to statutory subject matter." (Citations omitted.)); AT&T, 172 F.3d at 1359-60, 50 USPQ2d at 1453 (analysis should "focus on the inquiry deemed 'the ultimate issue' by Alappat, rather than on the physical limitations inquiry of the Freeman-Walter-Abele test").

Because the Federal Circuit has effectively overruled the Freeman-Walter-Abele test, and has made it clear that mathematical algorithms are not a separate exclusion, but part of the "abstract idea" exclusion, there is no need to determine the presence of a mathematical algorithm and it appears that the State Street test is not limited to subject matter containing mathematical algorithms.

The Federal Circuit held that the statutory category to which a claim is directed is not determinative of statutory subject matter, as long as it falls into at least one category of statutory subject matter. See State Street, 149 F.3d at 1372, 47 USPQ2d at 1600 ("[F]or purposes of a § 101 analysis, it is of little relevance whether claim 1 is directed to a 'machine' or a 'process,' as long as it falls within at least one of the four enumerated categories of patentable subject matter, 'machine' and 'process' being such categories."); id. at 1375, 47 USPQ2d at 1602 ("The question of whether a claim encompasses statutory subject matter should not focus on which of the four categories of subject matter a claim is directed to--process, machine, manufacture, or composition of matter--but rather on the essential characteristics of the subject matter, in particular, its practical utility."); AT&T, 172 F.3d at 1357-58, 50 USPQ2d at 1451; Alappat, 33 F.3d at 1542, 31 USPQ2d at 1556 (precedent suggests that the mathematical subject matter exception to § 101 does apply to true apparatus claims, citing Johnson, 589 F.2d at 1077, 200 USPQ at 206 ("Benson applies equally whether an invention is claimed as an apparatus or process, because the form of the claim is often an exercise in drafting.")); Alappat, 33 F.3d at 1567, 31 USPQ2d at 1577 (Archer, C.J., concurring in part and dissenting in part) ("[A] claim formally to a general purpose computer running a certain program cannot be deemed to satisfy § 101 simply because the computer is a physical,

tangible device.")). Previously, only process claims and apparatus claims in means-plus-function language under § 112, last paragraph, were analyzed under § 101, as discussed in the "Pre-State Street" section, supra. State Street makes it easier to address computer not in means-plus-function format and computer-implemented process claims. However, I do not think it should be presumed that the Federal Circuit intends to indirectly hold that any series of steps is a "process" under § 101, regardless of whether it is machine implemented and regardless of whether it transforms subject matter. Thus, it will still not be easy to determine the threshold question of whether a non-machine-implemented method is a "process" under § 101.

The Federal Circuit stated that "'machine' claims having 'means' clauses may only be reasonably viewed as process claims if there is no supporting structure in the written description that corresponds to the claimed 'means' elements." State Street, 149 F.3d at 1371, 47 USPQ2d at 1599. A disclosure which consists solely of functional blocks would apparently meet this criterion. But see In re Dossel, 115 F.3d 942, 946-47, 42 USPQ2d 1881, 1885 (Fed. Cir. 1997) (assuming implementation on a general or special purpose computer to support claimed "reconstruction means" although "[n]either the written description nor the claims uses the magic word 'computer.'"). As evidenced by State Street, disclosure of a general purpose computer would be supporting structure. At issue in State Street was U.S. Patent 5,193,056, issued to Boes, and assigned to Signature Financial Group, Inc. The only structure disclosed in the Boes patent was "a personal computer 44 programmed with software 50" (col. 6, line 49). "The personal computer 44 used by portfolio/fund accountant 43 is capable of producing printed output 46 and storing data on data disk 52, which preferably is a floppy disk, although other types of storage media may be used." (Col. 6, lines 52-56.) The personal computer had a cathode ray tube (CRT) display (col. 7, line 60) and a way (undisclosed, but conventionally a keyboard) to allow a user to manually enter data (col. 8, lines 53-58). The court construed the "computer processor means" in claim 1 as "a personal computer including a CPU", construed "first means for initializing the storage medium" as "an arithmetic logic circuit configured to prepare the data disk to magnetically store selected data," and second, third, fourth, and fifth means as the arithmetic logic circuit configured to perform the various functions. Thus, although Boes did not describe the internal structure of the computer as having a CPU and arithmetic logic circuit, or the correspondence to the claimed means, this conventional computer structure was considered to be the structure corresponding to the claimed means. The court's conclusion in State Street that means-plus-function claims cannot be treated as process claims if a general purpose computer is disclosed in the written description represents a departure, without any explanation, from the earlier cases of Freeman, Maucorps, Sherwood, Walter, Pardo, Abele, and Meyer, where claims in means-plus-function format were treated as indistinguishable from process claims even though the only supporting structure was a programmed general purpose computer. However, since the form of the claim is not determinative of statutory subject matter, there appears to be no need to rely on the controversial treatment of machine claims as process claims.

Conclusions

The statutory subject matter test in State Street and AT&T was whether transformation of data by a machine or a machine-implemented process produces a "practical application, i.e., 'a useful, concrete and tangible result.'" I draw the following conclusions about the State Street test:

First, the test is limited to the context of transformation of data in machines and machine-implemented processes. The court was not considering a process claim that could be performed without a machine. Machines and machine-implemented processes have generally been considered statutory subject matter, except in the special case where the mere manipulation of a mathematical algorithm is involved. A machine implementation implicitly requires a physical transformation of subject matter, e.g., transformation of electrical signals into a different state or signal within a computer. A machine-implemented process is at least potentially "a new use of a known ... machine" and, therefore, within the statutory definition of a "process" in § 100(b). It is probably still true that, as stated in In re Benson, "machines--the computers--are in the technological field, are a part of one of our best-known technologies, and are in the 'useful arts' rather than the 'liberal arts,' as are all other types of 'business machines,' regardless of the uses to which their users may put them," 441 F.2d at 688, 169 USPQ at 553, with the exception noted in Gottschalk v. Benson, that a machine which executes a mathematical algorithm is not patentable under § 101. Thus, the test is not, at this time, a general test for statutory subject matter not tied to a machine.

Second, it is not limited to mathematical subject matter. The court stated that two-part Freeman-Walter-Abele test, the first part of which is to determine the presence of a mathematical algorithm, is of little value and that the focus should be on the ultimate issue of whether the claim as a whole is drawn to statutory subject matter.

Third, what the data represents is important. The claimed machine or machine-implemented process was held to recite a "useful, concrete and tangible result" because the data transformed by the machine was representative of something in the real world. It appears that the nature of the data is what indicates the algorithm is applied in a "useful" way.

Fourth, no physical transformation had to take place outside of the machine, i.e., the computed end result did not have to control some external system.

Fifth, in the absence of definitions of what is meant by a "practical application, i.e., 'a useful, concrete and tangible result,'" I interpret the test to be a restatement of existing legal principles, rather than a completely new test. "Concrete and tangible" are the opposite of an "abstract idea" and are interpreted to mean that the claimed subject

matter is "embodied" within at least one of the categories of inventions of § 101. A number calculated by a machine, as in Alappat, State Street, and AT&T, is a "concrete and tangible result" because of the physical nature of the machine. A "useful result" is interpreted to mean that the subject matter satisfies the utility requirement of § 101. A "practical application" requires both a "useful result" and a "concrete and tangible result." Thus, a computer-implemented process would normally be a statutory "process," and also produce a "concrete and tangible result," because the computer is physical and transforms electrical signals, but the process may fail to satisfy the "utility" requirement if it is merely a mathematical algorithm which transforms data that does not correspond to something in the real world. (Although eligible subject matter and utility are separate requirements of § 101, the court appears to use the "utility" requirement as part of the statutory subject matter analysis.) Conversely, a claim to a non-machine-implemented process may have "utility" to society, but the subject matter may not be "embodied" in subject matter within the "useful arts" ("technological arts") as specified by the categories of § 101 so as to produce a "concrete and tangible result." See 1 Patents § 1.01 ("Theoretical or abstract discoveries are excluded as are discoveries, however practical and useful, in nontechnological arts, such as the liberal arts, the social sciences, theoretical mathematics, and business and management methodology.").

Sixth, the test appears to be a substitute for analyzing nonstatutory subject matter in terms of the exceptions for "laws of nature, physical phenomena and abstract ideas." Since the statutory category to which a claim is directed is not determinative of statutory subject matter, it is possible that real physical machines and manufactures (things that are not truly an "abstract idea") may be nonstatutory subject matter.

Non-machine-implemented processes

The test in State Street and AT&T does not cover all nonstatutory subject matter situations. The claims in State Street and AT&T (and Arrhythmia Research and Alappat, which were discussed in State Street), were all directed to subject matter that constituted transformation of data by a machine or a machine-implemented process. Therefore, the test does not necessarily apply to the situation of method claims which are not expressly or implicitly performed by machines, i.e., "non-machine-implemented processes," which may or may not involve transformation of data. Non-machine-implemented processes are typified by the mathematical algorithm cases of Gottschalk v. Benson (claim 13 recited a "data processing method," but did not expressly or implicitly require that it was performed on a computer), Parker v. Flook (method of updating an alarm limit), Sarkar (method for mathematically modeling an open channel), Grams (method of diagnosing an abnormal condition in an individual), Schrader (method of bidding on a plurality of related items), and Warmerdam (method of generating a data structure representing the shape of a physical object), all of which were held nonstatutory. However, the issue of nonstatutory subject matter and non-

machine-implemented process claims is not limited to claims involving mathematical algorithms. The present application is only one example of many non-machine-implemented process claim cases now pending in the USPTO.

It is known that claims have to be drafted to be within at least one of the statutory categories of § 101. Subject matter within the categories of "machine, manufacture, or composition of matter" requires physical structure. However, a "process" under § 101 is not limited to the means (structure) used in performing it and structure for performing the steps is often not claimed. Usually, the chemical, electrical, and mechanical acts that indicate a statutory transformation of subject matter are evident from the nature of the steps or the claim language (e.g., mixing, signaling, etc.). However, the absence of structural limitations or clear language indicating a physical transformation of physical subject matter can make it difficult to determine whether the series of steps is a statutory "process." The problem is that "abstract ideas," such as mathematical algorithms, and other kinds of subject matter, which do not appear to belong in the "useful arts," are easily and naturally drafted as a series of steps, which fits the dictionary definition of a process. The USPTO then has the difficult job of showing why the subject matter is nonstatutory.

There are several issues that make the analysis of non-machine-implemented processes difficult. First, some claims may be interpreted as broad enough to cover both nonstatutory subject matter (e.g., a non-machine-implemented mathematical algorithm) and statutory subject matter (e.g., assuming the process, if performed by a machine, would be statutory subject matter), in which case the USPTO considers the claim to be unpatentable (although the issue has never been expressly decided). (By contrast, there has never been an argument that a process performed without a machine would be patentable subject matter, but the same process performed on a machine would be unpatentable.) Claims are given their broadest reasonable interpretation and implicit limitations are not read into the claims to make the claimed subject matter statutory. In particular, the fact that the method may be disclosed to be performed by a machine will not be read into a claim which does not require it. Second, which is related to the first issue, there is a question whether the so-called "technological arts" standard, at least as originally expressed in Musgrave, which gives no weight to how the steps are performed (machine steps versus "mental steps" ("abstract ideas")), is a valid test for statutory subject matter. Third, since process claims do not need to recite the means (structure) to perform the steps, there is a question of how to determine whether the claims recite a transformation of "physical subject matter" to a different state or thing when no structure is recited in the claims. Fourth, there is a question of whether minor physical limitations are sufficient to define a statutory process. Fifth, although it is not an issue in this case, there is a question of what to do with processes that can only be performed by a human, such as sports moves like high jumping or golfing. I try to address these issues in the following discussions for completeness, although not all of them apply to the present appeal.

Claims that read on statutory and nonstatutory
subject matter are unpatentable

One important, but unresolved legal issue, is whether claimed subject matter that is broad enough to read on both statutory subject matter and nonstatutory subject matter should be considered to be statutory or nonstatutory. Although certain CCPA cases, discussed *infra*, appear to hold that claims that are broad enough to read on statutory as well as nonstatutory processes are patentable if they are within the "technological arts," these cases appear to have been implicitly overruled by the Supreme Court in *Gottschalk v. Benson*. While most cases in the following discussion involve mathematical algorithms, the principle to be discussed is not so limited. The history of this issue involves the now abandoned "mental steps doctrine" and the "technological arts" test for statutory subject matter on which the examiner has relied in this case.

Assume that a series of steps if performed by a machine would be statutory subject matter, but that the same series of steps without a machine would be considered nonstatutory subject matter. For example, transformation of data by a machine might be statutory subject matter, while transformation of data without a machine (e.g., a mathematical algorithm that could be performed mentally) would be nonstatutory subject matter as an "abstract idea" or for failing to meet the transformation definition of a "process." Because a generally claimed process is not limited to the means (structure) disclosed as being used in performing it, it is common for process claims to recite steps without the means (structure) to perform the steps. The situation is that the claim does not recite how the steps are implemented and does not expressly or implicitly recite a machine implementation. Therefore, the claim covers both the "abstract idea," which the USPTO considers nonstatutory subject matter, as well as a machine implementation, which might be statutory subject matter; i.e., the steps could be performed by a machine, and a machine may be disclosed, but the claim itself does not require a machine. This is a very old situation, as described in connection with the "mental steps" cases by R.I. Coulter, *The Field of the Statutory Useful Arts (Part I)*, 34 J. Pat. Off. Soc'y. 417, 426 (1952), cited in *Musgrave*, 431 F.2d at 889 n.4, 167 USPQ 287 n.4:

There is an important point that should not be overlooked. In all of the technological "mental step" cases, the claims say nothing about mental steps or a human operator. The situation is that one or more steps are of such nature that they can be performed by a human operator, who is required to use his brain, and that no device for automatically performing such steps is specifically described in the specification. The claims are held not to define a statutory "useful art" even though, if the method were performed without a human operator (which is not excluded from the claims), it would constitute a statutory "useful art." In the *Abrams* case, for instance, there was no intimation that the

specified petroleum prospecting method would not be a "useful art" if the criticized steps were performed by devices.

Although the old cases use the term "mental steps," the situation was that "the claims say nothing about mental steps or a human operator," Coulter, 34 J. Pat. Off. Soc'y at 426, i.e., the claims are silent about any means of performing the steps, so a more appropriate description is an "abstract idea." The term "mental steps" may originate from the fact that, as a practical matter, methods have to be performed somehow and the term "mental steps" distinguishes a process that may be performed without a machine over one that requires machine implementation. While the "mental steps" cases depended on what structure was disclosed, the real issue is what structure is required by the claims.

In Prater, process claim 9 was broad enough to read on both statutory (machine-implemented) subject matter and nonstatutory (abstract or mental steps) subject matter. In Prater I, the CCPA found no problem with this claim breadth, stating that "patent protection for a process disclosed as being a sequence or combination of steps, capable of performance without human intervention and directed to an industrial technology--a 'useful art' within the intendment of the Constitution--is not precluded by the mere fact that the process could alternatively be carried out by mental steps," 415 F.2d at 1389, 159 USPQ at 593. On rehearing, the court held that process claim 9, which read on a mental process augmented by pencil and paper markings, which appellants acknowledged was not their invention, as well on as a machine implemented process, fails to comply with the requirement of § 112, second paragraph, which requires "claims particularly pointing out and claiming the subject matter which the applicant regards as his invention." See Prater II, 415 F.2d at 1404, 162 USPQ at 550. Thus, the court acknowledged that claim 9 read on both statutory and nonstatutory subject matter, but refrained from deciding whether the subject matter of claim 9 was nonstatutory. The § 112, second paragraph, reasoning was raised in several subsequent cases in addition to the § 101 rejection.

The CCPA avoided the statutory/nonstatutory issue in Bernhart, 417 F.2d 1395, 163 USPQ 611. The invention was a method and apparatus for automatically making a two-dimensional portrayal of a three-dimensional object from any desired angle and distance and any desired plane of projection. The court reversed the § 101 rejection of the apparatus claims based on several rationales, which are not relevant to the present analysis. Method claim 13 recited the steps of programming a computer to compute positions of planar axes, programming the computer to render an output representative of the coordinates of planar point positions, and applying the output of the computer to a plotting apparatus. The court referred to Prater II and noted that it had not ruled on whether claims covering truly mental steps could be statutory under § 101, but had held that applicants claimed more than they regarded as their invention thus rendering the claims unpatentable under § 112, second paragraph. Id. at 1400-01, 163 USPQ at 616-17. The court found that the disclosure shows only machinery for carrying out the

process and thus a statutory process was disclosed. Id. at 1401, 163 USPQ at 617. The court held that claim 13 "in no way covers any mental steps but requires both a 'digital computer' and a 'planar plotting apparatus' to carry it out," id., and held the method defined by claim 13 to be statutory.

The CCPA expressly avoided the statutory/nonstatutory issue in Mahoney, 421 F.2d 742, 164 USPQ 572. In Mahoney, the Board found that the claims read on both mental and nonmental implementation of a process and affirmed a rejection under 35 U.S.C. §§ 100, 101. The Board also agreed with the examiner that "a claim which embraces that which cannot be patented is not in conformity with [§ 112, second paragraph]." id. at 744, 164 USPQ at 574. Although it was not clear that there was a § 112 rejection, since both parties treated the case as containing a § 112 rejection, the court did also. The court noted that there was no dispute as to the statutory nature of the subject matter disclosed, which was a machine-implemented process. Id. at 745, 164 USPQ at 575. As to the § 101 statutory/nonstatutory issue the court stated:

Both sides in this case have assumed that if a claim reads on both mental and nonmental implementation of a process, the claim is drawn to nonstatutory subject matter. We refrained from deciding that question in Prater, *supra*, and we decline to decide it here. We shall assume, as appellant has, that such a claim would be nonstatutory under 35 U.S.C. 101.

Id. The court first considered the § 112, second paragraph, rejection and stated:

To inject any question of statutory subject matter into that paragraph is to depart from its wording and to complicate the law unnecessarily. The proper consideration here is whether the appealed claims cover only what appellant regards as his invention. Appellant, through counsel, has said at several points in this case that he intends the claims to cover only the machine implementation thereof. If the appealed claims accomplish that intent, not only will appellant have overcome the § 112 rejection, but he will also have overcome the § 101 rejection, since the machine-implemented process is clearly statutory. This question of what the claims reasonably cover is therefore dispositive of the case before us.

Id. at 745-46, 164 USPQ at 575. The court held that while there was "no express reference to a machine-implemented or nonmental process ... we have found that the term 'bit' when used in conjunction with 'bit stream' has a meaning in the art which precludes reading the claims on a mentally performable process" and reversed the decision of the Board. Id. at 747, 164 USPQ at 576. That is, since the claim reads only on the machine implementation it defines what applicant regards as his invention under § 112 and recites statutory subject matter under § 101. The court distinguished the case from Prater II where the claims did encompass performing the manipulations mentally with the possible aid or pencil and paper.

In Musgrave, "the court declined to follow the approach of Bernhart and Mahoney, i.e., determining whether the claim, interpreted reasonably, read upon mental implementation of the process or was confined to machine implementation." 1 Patents § 1.03[6][b]. The court noted that the mental steps doctrine was "purely a question of case law," 431 F.2d at 890, 167 USPQ at 287, and found the case law "to be something of a morass," id. The court seemed to hold that "mental steps" were only steps incapable of being performed by a machine or apparatus, id. at 889-890, 163 USPQ at 287, such as those involving subjective human judgments, which effectively disposed of the mental steps doctrine. The court found unsound the board's interpretation of "mental" as "encompassing steps performable by apparatus, as well as mentally." Id. at 890, 163 USPQ at 287. As to the board's assertion "that steps were 'mental' and rendered the claims non-statutory because they were not physical acts applied to physical things," id. at 892-893, 163 USPQ at 289, the court stated that there was no requirement that processes to be patentable, must operate on substances. The court held that process claims which read on both purely mental processes ("abstract ideas"), i.e., doing the steps mentally, as well as machine implemented processes, were statutory as long as the steps were in the "technological arts":

We cannot agree with the board that these claims (all the steps of which can be carried out by the disclosed apparatus) are directed to non-statutory processes merely because some or all of the steps therein can also be carried out in or with the aid of the human mind or because it may be necessary for one performing the processes to think. All that is necessary, in our view, to make a sequence of operational steps a statutory "process" within 35 U.S.C. § 101 is that it be in the technological arts so as to be in consonance with the Constitutional purpose to promote the progress of "useful arts." Const. Art. 1, sec. 8. [Emphasis added.]

Id. at 893, 167 USPQ at 289-90. Thus, the court equated the "technological arts" with the "useful arts." The court gave no guidance how to determine whether a series of steps is within the "useful arts" ("technological arts") if no machine is recited. Judge Baldwin noted in his concurrence that the "technological arts" holding was new law and that since the majority did not place any limits on the holding, this would allow claims to purely mental steps. Id. at 894-95, 167 USPQ at 290-91. See also Diamond v. Diehr, 450 U.S. at 201 n.16, 209 USPQ at 14 n.16 (Stevens, J. et al., dissenting) ("The author of the second Prater opinion, Judge Baldwin, disagreed with the Musgrave 'technological arts' standard for process claims. He described the standard as 'a major and radical shift in this area of the law.' As Judge Baldwin read the majority opinion, claims drawn solely to purely mental processes were now entitled to patent protection. Judge Baldwin's understanding of Musgrave seems to have been confirmed in In re Foster." (Citations omitted.)).

The "technological arts" test for statutory subject matter of Musgrave was approved in In re Foster, 438 F.2d 1011, 1015, 169 USPQ 99, 101 (CCPA 1971):

Under this [Musgrave "technological arts"] analysis, it is not important whether the claims contain mental steps or not if the process is within the technological arts. In the present case there can be no dispute that the process of removing distortion from seismograms is within the technological arts as was the closely related process of correcting seismic data in Musgrave. Therefore, we conclude that the method claims are directed to a statutory process.

The court also disagreed with the board's rejection that where claims read on both statutory and nonstatutory subject matter they "embrace that which can not be patented and must be denied as an overclaiming of the invention," id., under 35 U.S.C. § 112, second paragraph. The court "concluded that the claims are directed to a statutory process and, therefore, they do not embrace that which cannot be patented," id., and noted that this complication of § 101 with § 112 reasoning had been rejected in Mahoney, id. In response to appellants' indication that they intended to cover only the machine and machine-implemented process, the court found that some claims read on "manual manipulation," which goes beyond that which "applicant regards as his invention," and affirmed the rejection under the second paragraph of 35 U.S.C. § 112 "despite the fact that we have already found that the claims involve statutory subject matter," id. at 1016, 169 USPQ at 102.

The "technological arts" standard was refined in In re Benson, 441 F.2d 682, 169 USPQ 548 (CCPA 1971) to hold that computers, regardless of the uses to which they are put, are within the technological arts for purposes of § 101. Although there was a question of whether there was a rejection under § 112, second paragraph, the court found that "the board relied on only one ground, predicated on 35 U.S.C. § 101, that claims 8 and 13 are either directed to or at least embrace non-statutory subject matter" (emphasis added), id. at 686, 169 USPQ at 551. The appeal involved method claims 8 and 13. The court found that "Claim 8 is for a method to be practiced on particular apparatus specified to be a 'reentrant shift register,'" id. at 687, 169 USPQ at 552, and the claimed "operations of storing, shifting, and masking 'signals' ... can only mean signals of the kind upon which the disclosed electronic digital computer hardware operates," id., and held that "Claim 8 therefore covers only a machine-implemented process and the apparatus for carrying it out has been disclosed," id. As to method claim 13, the court noted that the Patent Office held claim 13 to be nonstatutory because it is basically "mental" in character. The court acknowledged that claim 13 covered "a process consisting of a sequence of steps which can be carried out by machine implementation as disclosed in the specification, by still another machine as disclosed during prosecution, and even manually although in actual practice it seems improbable anyone would ever do that, speed measured in milli- or even micro-seconds being essential in the practical utilization of such a process" (emphasis added). Id. at 688, 169 USPQ at 553. Thus, the court seemed to acknowledge the basis of the

rejection was that the claims read on mental and manual steps. The court stated, however:

Realistically, the process of claim 13 has no practical use other than the more effective operation and utilization of a machine known as a digital computer. It seems beyond question that the machines--the computers--are in the technological field, are a part of one of our best-known technologies, and are in the 'useful arts' rather than the 'liberal arts,' as are all other types of 'business machines,' regardless of the uses to which their users may put them. How can it be said that a process having no practical value other than enhancing the internal operation of those machines is not likewise in the technological or useful arts?" We conclude that the Patent Office has put forth no sound reason why the claims in this case should be held to be non-statutory.

Id. The court's holding that the machine-implemented process of claim 8 was statutory subject matter is understandable under then-existing law. However, although the court interpreted claim 13 to cover both machine and mental/manual implementations, rather than decide the § 101 statutory/nonstatutory issue, the court appeared to follow the "technological arts" test by holding it to be statutory subject matter.

Certiorari was granted in In re Benson, and the Supreme Court reversed. Gottschalk v. Benson, 409 U.S. 63, 175 USPQ 673. As previously discussed in the section "Pre-State Street," the Supreme Court recast the statutory subject matter issue in terms of mathematical algorithms, instead of the "mental steps" doctrine. Also, while the holding of Gottschalk v. Benson is not clear, it can be partly explained in terms of the claims not meeting the transformation of subject matter definition of a "process" under § 101, and claim 13 reading on an abstract idea ("mental steps") as well as a machine-implemented method. In any case, however, the important fact is that the Supreme Court did not apply the "technological arts" test. See Diamond v. Diehr, 450 U.S. at 201, 209 USPQ at 14 (Stevens, J. et al., dissenting) ("Justice Douglas' opinion for a unanimous Court made no reference to the lower court's rejection of the mental-steps doctrine or to the new technological-arts standard."). Thus, it appears that the "technological arts" test, at least in the Musgrave sense that a claim which covers both an abstract idea and a machine-implemented process is statutory as long as it is in the "technological arts," was implicitly overruled by Gottschalk v. Benson because the Court made no mention of it.

In the interval between the two Benson decisions, the CCPA decided two § 101 cases. In In re McIlroy, 442 F.2d 1397, 170 USPQ 31 (CCPA 1971), the claims defined a method for retrieving symbolic data from a stored string. The Board affirmed a rejection under § 101 "on the premise that only machine-implemented methods can be statutory, at least where information processing is concerned, and that the claims do not require machine implementation." Id. at 1398, 170 USPQ at 31. The court stated:

Under our decision in In re Musgrave, 431 F.2d 882, 57 CCPA 1352 (1970), machine implementation versus mental implementation is not a determinative dichotomy in deciding whether a method is statutory under 35 U.S.C. § 101. Further, in our decision in In re Benson, Cust. & Pat. App., 441 F.2d 682, decided May 6, 1971, we held that "a process having no practical value other than enhancing the internal operation of [digital computers]" was in the technological or useful arts and hence was statutory under § 101.

Id. at 1398, 170 USPQ at 31. Thus, McIlroy affirms the "technological arts" test of Musgrave, which appears to have been overruled by Gottschalk v. Benson. However, the method claims in McIlroy recited structure implicitly (claim 1 recited operations involving a "memory") or expressly (claim 7 recited a "machine method") and, thus, would have been statutory under the previous "mental steps" doctrine.

In Waldbaum I, claim 1 was directed to a method of controlling the operation of a data processor to determine the number of 1s in a data word and included many structural limitations, such as memory, registers, means for storing, means for performing logical operations, etc. "[T]he Board advanced a 'mental steps' rejection, i.e., that since the apparatus limitations in the claims were merely functional, the claims embrace 'that which could be only an act of the mind rather than calling for an act on a physical thing * * *.'" Id. at 1002, 173 USPQ at 43. The court stated:

With regard to the "mental steps" rejection, whether appellant's process is a "statutory" invention depends on whether it is within the "technological arts." The phrase "technological arts," as we have used it, is synonymous with the phrase "useful arts" as it appears in Article I, Section 8 of the Constitution. It is clear that appellant's process, which is useful in the internal operation of computer systems, is within the "useful arts." Appellant's process is therefore a statutory process within the meaning of 35 U.S.C. § 101. [Citations omitted.]

457 F.2d at 1003, 173 USPQ at 434. Thus, Waldbaum I affirms the "technological arts" test of Musgrave. Prosecution was reopened following Gottschalk v. Benson and the claims were again rejected under 35 U.S.C. §§ 100 and 101. The CCPA sustained the § 101 rejection based on the reasoning in Gottschalk v. Benson, not on the "technological arts" test. See Waldbaum II, 599 F.2d 611, 194 USPQ 465. This is further evidence that the "technological arts" test, at least as expressed in Musgrave and In re Benson, has been overruled.

The "technological arts" test of Musgrave, Foster, In re Benson, and McIlroy held that a claim which reads on both statutory (e.g., machine-implemented) and nonstatutory ("mental steps" or in modern terms an "abstract idea") subject matter is statutory under § 101 as long as the steps were in the "technological arts." The "technological arts" test eliminated the statutory subject matter distinction between machine-implemented processes and "mental steps" ("abstract ideas"). It appears that

the "technological arts" test as applied in these cases was implicitly overruled in Gottschalk v. Benson. Thus, claims which are broad enough to read on nonstatutory and statutory subject matter, e.g., because they do not recite any structure or physical transformations, may raise a nonstatutory subject matter issue under § 101.

Subsequent to Gottschalk v. Benson, several cases referred to "technological arts," but only in the sense that computer-implemented processes that did not claim mathematical algorithms were statutory subject matter. The CCPA did not hold after Gottschalk v. Benson that a claim which covers both an abstract idea and machine implementation is statutory as long as it is in the "technological arts." In Deutsch, 553 F.2d 689, 193 USPQ 645, the claims were directed to a method of operating a system of manufacturing plants. The court held: "Because the claimed invention considered as a whole does not preempt a mathematical formula, an involved algorithm, or a program per se, and because it is within the technologically useful art of controlling and optimizing a system of manufacturing plants to a particular end use, it is a statutory 'process' within the purview of 35 USC 101." Id. at 693, 193 USPQ at 649.

In Toma, 575 F.2d 872, 197 USPQ 852, the claims were directed to a method of operating a digital computer to translate from a source natural language, e.g., Russian, to a target natural language, e.g., English. The examiner rejected the claims as nonstatutory under Gottschalk v. Benson because the algorithm has no substantial practical application except in connection with a digital computer. The court noted that one class of claims that was clearly not rendered nonstatutory by Benson was those claims which do not directly recite a Benson-type algorithm. Id. at 877, 197 USPQ at 856-57. The court noted that the Supreme Court in Benson used the term "algorithm" in the specific sense of a mathematical procedure and found the claim did not directly or indirectly recite a mathematical algorithm. Accordingly, the court held that the claims were not rendered nonstatutory by Benson. This appears to be the principal holding of the case. The court noted another issue:

The examiner, in his Final Rejection and in his Examiner's Answer, appears to have rejected the claims because a computerized method of translating is not, the examiner submitted, in the "technological arts." The examiner cited [Musgrave, In re Benson, and McIlroy] ... for the proposition that all statutory subject matter must be in the "technological" or "useful" arts, and that, as far as computer-related inventions are concerned, only those inventions which "enhance the internal operation of the digital computer" are in the "technological" or "useful" arts. The examiner further stated that natural language translation is a "liberal art" and that effecting the translation by means of a machine does not transform the activity into a "technological art." The board's perfunctory treatment of this theory of rejection does not indicate approval or disapproval of it.

Id. at 877, 197 USPQ at 857. The court held:

[T]he method for enabling a computer to translate natural languages is in the technological arts, i.e., it is a method of operating a machine. The "technological" or "useful" arts inquiry must focus on whether the claimed subject matter (a method of operating a machine to translate) is statutory, not on whether the product of the claimed subject matter (a translated text) is statutory, not on whether the prior art which the claimed subject matter purports to replace (translation by a human mind) is statutory, and not on whether the claimed subject matter is presently perceived to be an improvement over the prior art, e.g., whether it "enhances" the operation of a machine. This was the law prior to Benson and was not changed by Benson. [Footnote omitted.]

Id. at 877-878, 197 USPQ at 857. The court also stated:

[T]he examiner has taken language from the cited cases and attempted to apply that language in a different context. Musgrave, In re Benson, and McIlroy all involved data processing methods useful in a computer, but not expressly limited to use in a computer. Furthermore, all of those cases involved a "mental steps" rejection. The language which the examiner has quoted was written in answer to "mental steps" rejections and was not intended to create a generalized definition of statutory subject matter. Moreover, it was not intended to form a basis for a new § 101 rejection as the examiner apparently suggests.

Id. at 878, 197 USPQ at 857. The "technological arts" rejection was reversed.

The issue of whether a claim that reads on both statutory and nonstatutory subject matter, is nonstatutory under § 101 was presented, but not decided, in Alappat. In Alappat, the Board found that a claim in means-plus-function format was broad enough to cover performing the steps on a general purpose computer, as well as on the specific disclosed circuitry. The Board treated the claim in means-plus-function format as a process claim in accordance with the procedure in Freeman, Maucorps, Sherwood, Walter, Pardo, Abele, and Meyer, and held that the claim was directed to nonstatutory subject matter as a mathematical algorithm (contrary to the court's statement that the Board held the claim to be unpatentable "merely" because it reads on a programmed general purpose digital computer, 33 F.3d at 1544, 31 USPQ2d at 1558). That is, the Board interpreted the claim as broad enough to read on both statutory subject matter (the specific disclosed circuit) and nonstatutory subject matter (performing with a general purpose computer was equivalent to a process) and held it to be nonstatutory. Alappat admitted that a general purpose computer was equivalent structure, and that a method which amounted to a mathematical method which was only supported by a programmed general purpose computer would be nonstatutory. Alappat, 33 F.3d at 1565, 31 USPQ2d at 1575. "Alappat's argument is that 'bona fide hardware supporting the "means plus function" recitals' in claim 15 renders the claimed

subject matter statutory, but then the claim may cover general purpose digital computers as equivalents through § 112, ¶6, even though that subject matter could not be claimed outright." Id. That is, Alappat considered that a claim which covers statutory as well as nonstatutory subject matter is statutory. The court construed the claim under 35 U.S.C. § 112, sixth paragraph, in accordance with the specific circuit to be "a specific machine to produce a useful, concrete, and tangible result," id. at 1544, 31 USPQ2d at 1557. The court noted that a programmed general purpose computer was also an apparatus. Id. at 1545, 31 USPQ2d at 1558. The court held that the claim could not be construed as a process claim because it must be construed as apparatus, id. at 1545 n.25, 31 USPQ2d at 1558 n.25. The court did not acknowledge or address Freeman, Maucorps, Sherwood, Walter, Pardo, Abele, and Meyer, relied upon by the Board, in which means-plus-functions claims were treated as process claims for the purpose of the § 101 analysis. The court mooted the issue of whether the claim was nonstatutory because it was broad enough to cover both nonstatutory subject matter (performing the functions with a general purpose computer) and statutory subject matter (the specific disclosed circuit), by holding that a programmed general purpose computer is a statutory apparatus. Under the subsequent State Street test, the subject matter would be statutory regardless of whether the machine is the specific circuitry or a general purpose computer.

The statutory/nonstatutory question was also addressed in Judge Gajarsa's concurrence in Smithkline Beecham Corp. v. Apotex Corp. Judge Gajarsa found that the claim to paroxetine hemihydrate covers both the synthetic product and a product of "a natural physical process whereby paroxitine anhydrate (a pre-existing synthetic crystal that today is in the public domain) could, under normal climactic conditions and with no human intervention, bond with water molecules and convert itself into paroxetine hemihydrate." 365 F.3d at 1330, 70 USPQ2d at 1755. Judge Gajarsa stated: "In short, patent claims drawn broadly enough to encompass products that spread, and appear, and 'reproduce' through natural processes cover subject matter unpatentable under Section 101--and are therefore invalid." Id. at 1331, 70 USPQ2d at 1756. That is, claims which are broad enough to cover both the nonstatutory natural product and the statutory synthetic product would be nonstatutory. Nevertheless, this was only in a concurrence.

Conclusion

The aspect of the "technological arts" test of Musgrave which states that a claim which covers both "mental steps" ("abstract idea") and a machine-implemented process, is statutory subject matter as long as it is in the "technological arts," has been implicitly overruled in Gottschalk v. Benson. Therefore, it is possible for a claim to read on both nonstatutory subject matter (an abstract idea) and statutory subject matter (if the abstract idea was implemented by a machine, which is not claimed, it might be statutory). In my opinion, the USPTO should continue its longstanding practice of holding the claimed subject matter to be unpatentable because, while a claim is

pending and can be amended, a claim must be given its broadest reasonable interpretation and a claim's meaning should be delimited by express terms rather than by claim interpretation or by reading limitations from the disclosure into the claim. Cf. In re Lintner, 458 F.2d 1013, 1015, 173 USPQ 560, 562 (CCPA 1972) ("Claims which are broad enough to read on obvious subject matter are unpatentable even though they also read on nonobvious subject matter."); In re Muchmore, 433 F.2d 824, 826, 167 USPQ 681, 683 (CCPA 1970) ("it is clear that claim 14 is too broad in the sense of section 103, since it reads on both obvious and unobvious subject matter"). In the USPTO, applicant can amend the claims to limit them to statutory subject matter. Cf. Prater II, 415 F.2d at 1404 n.30, 162 USPQ at 550 n.30 (Where a patent is at issue: "By construing a [patent] claim as covering only patentable subject matter, courts are able, in appropriate cases, to hold claims valid in order to protect the inventive concept of the inventor's contribution to the art. The patentee at that time usually may not amend the claims to obtain protection commensurate with his actual contribution to the art."). The alternative would be to interpret the claim as limited to statutory subject matter and leave it to the district courts to sort out what in the claim is nonstatutory subject matter from what is statutory. In my opinion, this is contrary to the duty of the USPTO. See Graham v. John Deere Co., 383 U.S. at 18, 148 USPQ at 467 ("[T]he primary responsibility for sifting out unpatentable material lies in the Patent Office. To await litigation is--for all practical purposes--to debilitate the patent system.").

"Technological arts" test

I am aware from this and other cases that the Patent Examining Corps considers Musgrave, Toma, and Bowman to impose a separate "technological arts" test for statutory subject matter. Apparently, the Corps defines "technological arts" as subject matter involving the use of "technology" and does not consider a process performed without a computer or other apparatus, or which must be performed in whole or part by a human, to be in the "technological arts."

There is no question that claimed subject matter must be within the "useful arts" of the Constitution. "Useful arts" is synonymous with "technological arts." The "useful arts," and thus the "technological arts," are defined by Congress in the four categories of invention in § 101, subject to the exceptions for "laws of nature, physical phenomena and abstract ideas." It is clear that a "machine, manufacture, and [man-made] composition of matter" are man-made "things" that fall within the "useful arts."

A "process" is much more difficult to analyze because, although every series of steps is a process within the dictionary definition, and may have been conceived by man, not every series of steps is considered a "process" under § 101. The Supreme Court's definition of a statutory "process" as requiring the transformation of physical subject matter (which can be tangible or intangible, and which I interpret to be the transformation of matter or a form of energy) from one state into another provides the "useful arts" aspect. In my opinion, the definition of "engineering" as "the application of science and mathematics by which the properties of matter and the sources of energy

in nature are made useful to man in structures, machines, products, systems, and processes," supra, best describes what is meant by "useful arts," and the four classes of § 101 are consistent with this definition. Therefore, I consider the "useful arts" or "technology" requirement implicit in the classes of § 101.

Musgrave held that a claim that covers both "mental steps" and a machine-implemented process, is statutory subject matter as long as it is "in the technological arts so as to be in consonance with the Constitutional purpose to promote the progress of 'useful arts.'" Musgrave, 431 F.2d at 893, 167 USPQ at 289-90. This statement can be viewed either as merely equating the "technological arts" with the "useful arts," a matter of definition that does not create a separate test, or as creating a separate "technological arts" test. The majority views the statement as not creating a separate "technological arts" test. However, it appears that it was intended to create a new test, at least in the situation where the claims are broad enough to cover both mental and machine-implemented steps. One of the judges in Musgrave considered it to create a new test. See id. at 895, 167 USPQ at 291 (Baldwin, J., concurring) ("First and foremost [of the problems with the majority's new holding] will be the problem of interpreting the meaning of 'technological arts.'"). See also Diamond v. Diehr, 450 U.S. at 201, 209 USPQ at 14 (Stevens, J. et al., dissenting) ("The court [in Musgrave] also announced a new standard for evaluating process claims under § 101: any sequence of operational steps was a patentable process under § 101 as long as it was within the 'technological arts.'" (Emphasis added.)); id. at 201 n.16, 209 USPQ at 14 n.16 ("The author of the second Prater opinion, Judge Baldwin, disagreed with the Musgrave 'technological arts' standard for process claims. He described the standard as 'a major and radical shift in this area of the law.' As Judge Baldwin read the majority opinion, claims drawn solely to purely mental processes were now entitled to patent protection. Judge Baldwin's understanding of Musgrave seems to have been confirmed in In re Foster." (Citations omitted.)); id. at 201, 209 USPQ at 14 ("The 'technological arts' standard was refined in In re Benson, in which the court held that computers, regardless of the uses to which they are put, are within the technological arts for purposes of § 101." (Citation omitted.)). However, this new "technological arts" test was implicitly overruled by the Supreme Court in Gottschalk v. Benson. See id. at 450 U.S. at 201, 209 USPQ at 14 ("Justice Douglas' opinion for a unanimous Court [in Gottschalk v. Benson] made no reference to the lower court's rejection of the mental-steps doctrine or to the new technological-arts standard." (Emphasis added.)). Thus, to the extent Musgrave created a separate "technological arts" test, which was followed in Foster, McIlroy, and In re Benson, it has been implicitly overruled by Gottschalk v. Benson.

In addition, Musgrave is not a good case for the Corps to rely on because it held that a claim to a sequence of steps that could be performed entirely mentally could be statutory subject matter if it was in the "technological arts," but does not explain how mental steps are in the "technological arts." Also, since mental steps could be statutory subject matter, Musgrave did not require a computer to define statutory subject matter

and, thus, does not support the reasoning that a computer is necessary for a statutory process in the "technological arts" and that a process performed solely by a human is nonstatutory. These facts of Musgrave are often not appreciated.

The principal holding of Toma was that the claim was statutory subject matter because it did not recite a mathematical algorithm in the Gottschalk v. Benson sense. As to the examiner's rejection that the computerized method of translating was not in the "technological arts," the court stated that, first: "[T]he method for enabling a computer to translate natural languages is in the technological arts, i.e., it is a method of operating a machine. The "technological" or "useful" arts inquiry must focus on whether the claimed subject matter ... is statutory" 575 F.2d at 877, 197 USPQ at 857. This equates the "useful arts" and the "technological arts" and states that a claim to computer which performs a function that is not just a mathematical algorithm is statutory subject matter. The court also stated that, second: "The language which the examiner has quoted was written in answer to 'mental steps' rejections and was not intended to create a generalized definition of statutory subject matter. Moreover, it was not intended to form a basis for a new § 101 rejection as the examiner apparently suggests." Id. Thus, Toma expressly rejects a separate "technological arts" test, at least for non-mental step process claims. The fact that the computer method in Toma was found to be in the technological arts does not necessarily imply that a method without a computer is not in the technological arts, as apparently assumed by the examiner. In my opinion, Toma simply reflects the position after Gottschalk v. Benson that computer-implemented processes are statutory subject matter unless it merely recites a mathematical algorithm.

Ex parte Bowman, which is not a precedential Board opinion, states that "the invention ... does not promote the progress of ... the useful arts, and does not fall within the definition of technological arts," 61 USPQ2d at 1671. Bowman equates the "technological arts" with the "useful arts" and does not appear to impose a separate "technological arts" test or, if it does, it does not define an objective test for "technological arts."

"Technological arts" is synonymous with the "useful arts" of the Constitution. The "technology" requirement is implicit in the statutory classes of § 101, and is not a separate test. No court has ever held subject matter to be nonstatutory applying a separate "technological arts" test. A "process" does not necessarily require a computer to be statutory subject matter and the performance of steps by a human does not necessarily mean that the subject matter is nonstatutory because it is possible to transform subject matter without a machine. A separate and distinct "technological arts" test would be very difficult to apply since what constitutes "technology" can always be debated and because some things, which may not seem "technological" in nature, clearly fall within the § 101 categories (e.g., a board game is a "manufacture" and a food product can be a "manufacture" or a "composition of matter"), and things which seem non-technical to engineers have been stated to be in the "technological arts," see

Schrader, 22 F.3d at 297, 30 USPQ2d at 1461 (Newman, J., dissenting) (non-computer-implemented method of bidding is "in technologically useful arts"). Furthermore, I have seen too many examples of examiners making conclusory statements that a product or method is not within the "technological arts" or does not involve "technology" to think that such a test would be workable or fair. Thus, I agree with the majority that the "technological arts" is not a separate test for statutory subject matter.

Transformation of subject matter

As discussed in the definition of a "process," although claims often do not recite the means (structure) for performing the steps, a statutory transformation of physical subject matter (matter or energy) to a different state or thing is evidenced by chemical, electrical, or mechanical steps, such as a manufacturing step or the function of machine. It is easy to see that steps for the transformation of tangible material and substances, such as making a new chemical by the physical steps of mixing, heating, etc., and the transformation of physical yet intangible subject matter, such as converting electrical currents into electromagnetic waves in an antenna or performing a CAT-scan operation, constitute a statutory process without the recitation of specific structure for performing the steps. Where a series of steps is expressly tied to a machine or specific apparatus, the physical transformation of subject matter by chemical, electrical, or mechanical steps is clear. Transformation of data by a machine or a machine-implemented method is a special case addressed by the test in State Street. It will not always be easy to determine whether an act performs a transformation. For example, is hitting a baseball a "transformation" because it results in a change in direction or velocity? What about acts like paying a bill or changing the price of a good for sale? What about acts such as manually drawing on a chart? However, I believe the Supreme Court's transformation test is the most workable test and can be developed by examples.

There is sometimes a question whether the claim implicitly requires a statutory physical transformation by a machine or is directed to an abstract idea, such as manipulation of data. "One distinction is made between transformation of physical 'signals' from one physical state to a different physical state, a statutory process in the electrical arts, and mere mathematical manipulation of 'data' which, by itself, is not a statutory process." Patentable Subject Matter, 1106 Off. Gaz. Pat. & Trademark Office at 9. The fact that a machine is disclosed for performing the steps, or that the steps are capable of being performed by a machine, should not be read into the claims. The problem faced by the USPTO is that, unlike in Prater II, applicants are seldom willing to state that the claims are limited to machine implementation and it is difficult to tell whether the claims actually require a machine or a transformation of physical subject matter.

It seems more logically rigorous to keep the transformation definition of a "process" and the "abstract idea" exception as separate concepts. There may be processes that involve physical steps that cannot truly be considered "abstract ideas," but which are, nevertheless, nonstatutory subject matter under the transformation of subject matter definition of a "process." Cf. State Street (a machine, manufacture, or machine-implemented process, something which is not strictly an "abstract idea," can be nonstatutory subject matter if it does not produce a "useful, concrete and tangible result").

Incidental physical limitations

It is often difficult to tell exactly where to draw the line between statutory and nonstatutory processes. "The line between a patentable 'process' and an unpatentable 'principle' is not always clear." Parker v. Flook, 437 U.S. at 590, 198 USPQ at 197. "The distinction may thus be fine indeed between statutory and nonstatutory subject matter, considering the glorious flexibility and frustrating limitations of the English language on the one hand, and the ingenuity of patent draftsmen on the other." de Castelet, 562 F.2d at 1243, 195 USPQ at 445. Often, in the past, minor physical limitations were added to what would otherwise be nonstatutory subject matter to try to get over that line. However, as stated in Parker v. Flook:

The notion that post-solution activity, no matter how conventional or obvious in itself, can transform an unpatentable principle into a patentable process exalts form over substance. A competent draftsman could attach some form of post-solution activity to almost any mathematical formula; the Pythagorean Theorem would not have been patentable, or partially patentable, because a patent application contained a final step indicating that the formula, when solved, could be usefully applied to existing surveying techniques. The concept of patentable subject matter under § 101 is not "like a nose of wax which may be turned and twisted in any direction" White v. Dunbar, 119 U.S. 47, 51. [Footnote and parallel citations omitted.]

437 U.S. at 590, 198 USPQ at 197. As further stated in Diamond v. Diehr:

We recognize, of course, that when a claim recites a mathematical formula (or scientific principle or phenomenon of nature), an inquiry must be made into whether the claim is seeking patent protection for that formula in the abstract. A mathematical formula as such is not accorded the protection of our patent laws, Gottschalk v. Benson, and this principle cannot be circumvented by attempting to limit the use of the formula to a particular technological environment, Parker v. Flook. Similarly, insignificant post-solution activity will not transform an unpatentable principle into a patentable process. To hold otherwise would allow a competent draftsman to evade the recognized limitations on the type of subject matter eligible for patent protection. On the other hand, when a claim containing

a mathematical formula implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (e.g., transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101. [Footnote omitted.] [Citations omitted.]

450 U.S. at 191-92, 209 USPQ at 10. In determining whether a process claim "as a whole" was directed to statutory subject matter, a body of case law developed around "field of use limitations," "data-gathering steps," and "post-solution activity." See Patentable Subject Matter, 1106 Off. Gaz. Pat. & Trademark Office at 8-10. It should not make any difference whether the "unpatentable principle" mentioned in Parker v. Flook and Diamond v. Diehr is a mathematical algorithm or some other type of abstract idea. The issue is especially difficult in claims which would be an abstract idea except for the presence of some physical steps.

In each of the non-machine-implemented process claim cases except Benson, which recited no physical step in claim 13, there was one or more arguably physical effects or results that the applicant unsuccessfully relied on to make the subject matter a statutory process. In Parker v. Flook it was a "post-solution" activity step of adjustment of the alarm limit; in Sarkar it was a step of measuring the cross-channel dimensions; in Grams it was performing clinical tests on individuals to obtain data; in Schrader it was the entering of bids in a "record"; and in Warmerdam appellant argued that the claims were broad enough to cover methods which involve physically, instead of mathematically, locating the medial axis of the object. Therefore, the mere presence of physical transformation steps is not enough to define statutory subject matter, although there is no general rule to say when a physical limitation is sufficient to define statutory subject matter. The cases for "field of use limitations," "data-gathering steps," and "post-solution activity" should still be good precedent for non-machine-implemented process claims.

Claims that cover only human activity

There is a problematic type of process claim where, although the claim is usually silent about how the steps are performed, some or all of the claimed steps must be performed by a human, either because they are uniquely human acts or because no presently known machine is capable of performing the steps. Claims having steps which involve subjective human judgment, such as "aesthetic, emotional, imaginative, or creative thought or reasoning on the part of the practitioners . . . [or] human 'value judgments,'" Musgrave, 431 F.2d at 889 n.4, 167 USPQ 287 n.4, may be regarded as indefinite under 35 U.S.C. § 112, second paragraph, rather than nonstatutory under § 101, id. at 893, 167 USPQ at 290. 1 Patents § 1.03[4]. This discussion refers only to human acts, physical or mental, which do not involve any subjective judgment.

A process is not limited to the means (structure) to perform it. A process may be statutory even if the steps are completely performed by a human. However, the key to a statutory "process" under § 101 is that it physically transforms physical subject matter to a different state or thing. For example, a step of "mixing" two chemicals to produce a manufacture or composition of matter is a physical, chemical, and/or mechanical act, a manufacturing step, regardless of whether it is performed by a machine or a human. Similarly, a physical step which could be performed by a machine (e.g., applying a force to transform an object) requires a transformation of subject matter even if the step is performed by a human. It is generally considered that machine-implemented processes are within the "useful arts" of the Constitution, except for the special case of transformation of data by a machine, now addressed by the State Street test. I am not aware of any cases that hold that a process, to be statutory subject matter, must be capable of being performed by a machine.

However, I do not consider a process that is performed with human physical actions, or a combination of mental and physical actions, where the physical actions do not transform physical subject matter to a different state of thing, to be statutory subject matter within the "useful arts" ("technological arts") of § 101. Perhaps a part of the concern with some human-performed methods is that the steps may not be guaranteed to produce the results or be repeatable, whereas machine-implemented process steps will reliably produce the expected result; however, this seems to be more of an enablement issue. Examples of human-performed steps are dance and sports moves; e.g., a high jumping or swimming technique, which may require both mental thoughts and physical acts. Arguably any human activity (muscle contraction), neural activity (thoughts, emotions), or endocrine activity (secretion of adrenal glands) involves chemical and physical changes that can be measured and (in theory) controlled or influenced. However, I submit that chemical, electrical, or mechanical transformations taking place by or within a human being are not the type of transformation indicating a process within the "useful arts" of § 101. While people sometimes refer to a "patented move" in sports, the USPTO has so far tried to resist patenting such human-performed subject matter. Surgical methods are performed by humans, but they involve the application of scientific medical knowledge to transform human and animal tissue; they are classifiable as a type of manufacturing process.

Since a "process" also "includes a new use of a known process, machine, manufacture, composition of matter, or material," 35 U.S.C. § 100(b), a "new use" must also meet the requirement for "transformation of physical subject matter to a different state or thing" to be a statutory "process." "New uses" of known devices which require only human acts raise a question of whether there is sufficient physical transformation to constitute statutory subject matter, e.g., a method of swinging a golf club.

Where one or more of the claimed steps is transforming physical subject matter (tangible or intangible) to a different state or thing by chemical, electrical, or mechanical steps and, therefore, meets the definition of a "process" under § 101, the presence of steps which may be performed by a human does not make the subject matter

nonstatutory. See Alco Standard Corp. v. Tennessee Valley Authority, 808 F.2d 1490, 1496, 1 USPQ2d 1337, 1341 (Fed. Cir. 1987) ("The inclusion in a patent of a process that may be performed by a person, but that also is capable of being performed by a machine, is not fatal to patentability. Diamond v. Diehr, 450 U.S. 175 (1981). The presence of the steps of correlating and combining, which a machine is capable of doing, does not invalidate the '006 patent.").¹ That is, all steps of a process do not have to be carried out only by a machine to be within the "useful arts." For example, the process in claim 11 of Diamond v. Diehr involved several steps, e.g., opening and closing a press, which could be performed by a human or automatically by a machine (the claims, as usual, did not say how they were performed), but the overall process was still a physical and chemical process for molding precision synthetic rubber products.

ANALYSIS

Claim interpretation

Appellant acknowledges that claim 1 does not expressly or implicitly recite a machine implementation. The claim limitations of step a), "choosing an absolute performance standard," and step f), "determining a relative performance measure," seem to require some human selection of a performance standard and do not appear to be capable of being performed automatically by a machine. Most of the steps indirectly include a mathematical algorithm: step b), "measuring an absolute performance standard of said primary firm," corresponds to the steps of inputting data in step 5 of Fig. 2 and computing a weighted sum of absolute performance data in step 6 of Fig. 2; step c), "measuring an absolute performance of each firm of said set of comparison firms," corresponds to the steps of inputting

¹ Although there is no jump cite for Diamond v. Diehr, the quote probably refers to the holding that "a claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula, computer program, or digital computer." Diamond v. Diehr, 450 U.S. at 187, 209 USPQ at 81.

data in step 7 of Fig. 2 and computing a weighted sum of absolute performance measures for each rival firm in step 8 of Fig. 2; step d), "determining a performance comparison base," corresponds to the step of computing a weighted average in step 9 of Fig. 2; step e), "comparing said measurement of absolute performance of said primary firm with said performance comparison base," corresponds to the subtraction step in step 10 of Fig. 2; and step g), "determining the managerial compensation amount derived from said relative performance measure according to a monotonic managerial compensation amount transaction," corresponds to the computation step 11 in Fig. 2. The last step h), "transferring compensation to said manager, said transferred compensation having a value related to said managerial compensation amount," corresponds to step 4 of Fig. 1.

Possible tests

The cases seem to provide four possible tests for statutory subject matter of non-machine-implemented process claims:

- (1) Transformation. The 1877 Cochrane v. Deener definition of a statutory "process" requires a transformation of physical subject matter to a different state or thing. As noted in Schrader, the subject matter transformed can be tangible or intangible, which I interpret to be matter or some form of energy to be consistent with the definition of "technology." This Supreme Court test has a good pedigree and I think defines the essential nature of a statutory "process" and "technology." I believe that all cases where statutory subject matter was found can be explained with this test.
- (2) Exceptions. The exceptions for "laws of nature, physical phenomena and abstract ideas," are, logically, a second test, i.e., "but for" the exceptional condition, the claimed process would be patentable subject matter. Exceptions, while providing counterexamples, often fail to provide positive definitions. Moreover, an "abstract idea" can be found in any process and the detection of its presence, like the finding of a mathematical algorithm, is not dispositive. It is difficult to determine whether a process is merely a "law of nature," "physical phenomena," or "abstract idea," because the claims are usually drafted to recite minor physical limitations such as data-gathering steps, field of use limitations, and post-solution activity. The question is whether the claim "as a whole" is directed to the kind of subject matter that was intended to be protected.
- (3) "Useful, concrete and tangible result". The State Street test of a "practical application, i.e., 'a useful, concrete and tangible result,'" was stated in the context of transformation of data by a machine or a machine-implemented process. The test has not yet been applied as a general test for statutory subject matter of non-machine-implemented processes. The terms are not defined, nor has any authority been cited for this test. Machines are concrete physical things and

processes performed on machines would seem to produce a "concrete and tangible result." To the extent the State Street test applies to non-machine-implemented process claims, I would interpret a "concrete and tangible result" to be another way of saying that the claim must not be directed to an "abstract idea" and to require a transformation of physical subject matter under the definition of a "process" in test (1), and/or a finding that the subject matter is not an "abstract idea" under test (2); i.e., it must recite eligible subject matter. The "useful result" part of the test is interpreted to mean that subject matter, which qualifies as a statutory "process," has utility according to the utility requirement of § 101. A "practical application" requires that the subject matter produces a "useful result" and a "concrete result" and tangible result." The State Street test appears to combine the separate § 101 requirements for eligible subject matter (subject matter within a category of "process, machine, manufacture, or composition of matter") and utility.

- (4) "Technological arts". For the reasons stated in the section entitled "'Technological arts' test," I conclude that there is no separate "technological arts" test. The "technology" requirement implied by "technological arts" is contained within the definitions of the statutory classes. While I understand the desire for a simple test, I believe that sanctioning such a test would inevitably lead to bare conclusory statements that "the claimed subject matter is not within the technological arts and does not involve technology" with no way for applicants to show otherwise.

Analysis

The three tests are applied below.

(1)

Claim 1, as is common with method claims, does not recite how the steps are implemented. The claimed steps are broad enough to be performed without a machine and appellant admits that a machine is not disclosed or claimed. The claimed steps do not require transformation of any physical subject matter, such as an electrical signal, into a different state or thing. Steps a) and f) are directed to the abstract ideas of selecting a performance standard and measure and, as claimed, require no physical embodiment or transformation. Steps b), c), d), e), and g), all correspond to computation steps, which, since no machine is claimed, are disembodied. The only things transformed are numbers related to performance data of the primary firm and the comparison firms, numbers related to the relative performance, and numbers related to a managerial compensation amount. The last step h) does not recite any physical implementation.

Although steps b) and c), as recited and disclosed, imply data input steps, there is nothing necessarily physical about these steps as claimed. However, even if there was, this would be nothing more than routine data gathering which does not make the subject matter statutory. See Sarkar, 588 F.2d at 1335, 200 USPQ at 139 ("If the steps of gathering and substituting values were alone sufficient, every mathematical equation, formula, or algorithm having any practical use would be per se subject to patenting as a 'process' under § 101."); Grams, 888 F.2d at 839-40, 12 USPQ2d at 1828. The last step h), "transferring compensation to said manager, said transferred compensation having a value related to said managerial compensation amount," as broadly recited, does not transform any physical subject matter to a different state or thing, or require any specific kind of physical activity, it merely transfers ownership of money. The transferring step can be manually recording an amount in a ledger, payment of paper money, an IOU, a verbal commitment, an electronic direct deposit, etc. Not all physical acts are the kinds of acts that give rise to a statutory process. Further, step h) is considered to be nothing more than an incidental post-solution activity step, which cannot convert a nonstatutory abstract idea into a statutory process. See Parker v. Flook, 437 U.S. at 590, 198 USPQ at 197 ("The notion that post-solution activity, no matter how conventional or obvious in itself, can transform an unpatentable principle into a patentable process exalts form over substance."); Diamond v. Diehr, 450 U.S. at 191-92, 209 USPQ at 10 ("[I]nsignificant post-solution activity will not transform an unpatentable principle into a patentable process."). These statements in Supreme Court cases cannot be ignored.

In accordance with State Street, we do not rely on the presence of the mathematical algorithm in a Freeman-Walter-Abele analysis, but, instead, focus on the ultimate question of whether claim 1, as a whole, recites a statutory process. Here the claimed plan to reduce incentives for industry collusion is based on business, economic, game theory, or antitrust knowledge, not the application of natural science or engineering knowledge to physical structure or to physical acts which transform physical subject matter (matter or a form of energy) to a different state so as to be a practical application of "technology." I hold that claim 1 is directed to nonstatutory subject matter because the steps do not transform physical subject matter from one state to another, as required by the definition of a § 101 "process."

(2)

The subject matter of claim 1 is also directed to an "abstract idea" or, at least, it is nonstatutory because it broadly covers both the nonstatutory "abstract idea" and any physical implementation of it that might possibly be statutory. Claim 1 describes a plan or scheme for compensating a manager to reduce incentives for industry collusion. It is nothing but an disembodied "abstract idea" until it is instantiated in some physical way within one of the categories of the "useful arts" in § 101 so as to become a practical application of the idea. None of the claimed steps recite how the steps are physically implemented; thus, the steps remain a disembodied "abstract idea." Because the

steps, including the last step of "transferring compensation," cover any and every possible way of performing the steps of the plan, by human or by any kind of machine, this is evidence that claim 1 is so broad that it is directed to the "abstract idea" itself, rather than a practical means for implementing the concept. Even if, for some reason, the last step of "transferring compensation" is considered a concrete physical act, not every physical act is the kind of act that gives rise to a statutory process. Further, step h) is incidental post-solution activity that does not transform a nonstatutory abstract idea into a statutory process. See Parker v. Flook, 437 U.S. at 590, 198 USPQ at 197; Diamond v. Diehr, 450 U.S. at 191-92, 209 USPQ at 10. While physical acts of individuals or organizations would, no doubt, be required to implement the steps, and while the actual implementation of the plan in some specific way might be considered statutory subject matter, these unrecited limitations can not be read into the claim. The fact that claim 1 might cover both statutory and nonstatutory subject matter does not make it statutory. Thus, I further conclude that claim 1 is directed to nonstatutory subject matter because it falls within the "abstract idea" exception.

(3)

I concluded in (1) that the claimed subject matter on appeal does not fall within the definition of a "process" under § 101 because it does not transform physical subject matter into a different state or thing, and concluded in (2) that it is an "abstract idea." Thus, because a "concrete and tangible result" is the opposite of an "abstract idea" and requires some sort of physical instantiation, I conclude that claim 1 does not recite a "concrete and tangible result" or a "practical application" of the plan for reducing incentives for industry collusion under the State Street test requiring a "useful, concrete and tangible result." While the plan may be "useful" in the sense that it is capable of having utility to society, assuming that is what is meant by the term in the State Street test, the State Street test requires the result to be "useful" and "concrete" and "tangible," so merely being "useful" is not enough. Claim 1 describes the abstract idea itself, not a concrete and tangible embodiment of the idea. For these reasons, I disagree with the examiner's conclusion (answer, p. 3) that the claims recite a "useful, concrete and tangible result" under the State Street test. Therefore, I also hold that claim 1 is directed to nonstatutory subject matter because it does not recite a "practical application" or produce a "concrete and tangible result" under the State Street test, to the extent that the test applies to non-machine-implemented process claims.

CONCLUSION

For the reasons stated above, I agree that there is no separate and distinct "technological arts" test, but conclude that claim 1 is not directed to statutory subject matter under 35 U.S.C. § 101 for different reasons than those expressed by the examiner. I would enter new grounds of rejection as to claims 1, 2, 6, 7, 19-22, 32, and 35-40.

LEE E. BARRETT
Administrative Patent Judge)

) BOARD OF PATENT
) APPEALS
) AND

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Appeal No. 2003-2088
Application 08/093,516

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**STATE STREET BANK & TRUST CO., Plaintiff-Appellee, v. SIGNATURE
FINANCIAL GROUP, INC., Defendant-Appellant.**

96-1327

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

149 F.3d 1368; 1998 U.S. App. LEXIS 16869; 47 U.S.P.Q.2D (BNA) 1596

July 23, 1998, Decided

SUBSEQUENT HISTORY: [**1] Certiorari Denied
January 11, 1999, Reported at: *1999 U.S. LEXIS 493*.

OPINIONBY: RICH

PRIOR HISTORY: Appealed from: U.S. District Court
for the District of Massachusetts. Judge Patti B. Saris.

OPINION:

[*1370] RICH, Circuit Judge.

DISPOSITION: REVERSED and REMANDED.

COUNSEL: William L. Patton, Ropes & Gray, of Boston, Massachusetts, argued for plaintiff-appellee. With him on the brief were James L. Sigel and James S. DeGraw. Also on the brief was Maurice E. Gauthier, Samuels, Gauthier, Stevens & Reppert.

Signature Financial Group, Inc. (Signature) appeals from the decision of the United States District Court for the District of Massachusetts granting a motion for summary judgment in favor of State Street Bank & Trust Co. (State Street), finding U.S. Patent No. 5,193,056 (the '056 patent) invalid on the ground that the claimed subject matter is not encompassed by 35 U.S.C. § 101 (1994). See *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 927 F. Supp. 502, 38 U.S.P.Q.2D (BNA) 1530 (D. Mass. 1996). We reverse and remand because we conclude that the patent claims are directed to statutory subject matter.

Steven L. Friedman, Dilworth, Paxson, Kalish & Kauffman LLP, of Philadelphia, Pennsylvania, argued for defendant-appellant. With him on the brief were Steven J. Henry, Wolf, Greenfield & Sacks, P.C., of Boston, Massachusetts; and Philip G. Koenig, Pittas Koenig, of Winchester, Massachusetts.

BACKGROUND

William T. Ellis, Foley & Lardner, of Washington, D.C., for amicus curiae Information Technology Industry Council. With him on the brief were Harold C. Wegner, Richard L. Schwaab, and Mary Michelle Kile. Of counsel was John F. Cooney, Venable, Baetjer, Howard & Civiletti, LLP.

Signature is the assignee of the '056 patent which is entitled "Data Processing System for Hub and Spoke Financial Services Configuration." The '056 patent issued to Signature on 9 March 1993, naming R. Todd Boes as the inventor. The '056 patent is generally directed to a data processing system (the system) for implementing an investment structure which was developed [**3] for use in Signature's business as an administrator and accounting agent for mutual funds. In essence, the system, identified by the proprietary name Hub and Spoke (R), facilitates a structure whereby mutual funds (Spokes) pool their assets in an investment portfolio (Hub) organized as a partnership. This investment configuration provides the administrator of a mutual fund with the advantageous combination of economies of scale in administering investments coupled with the tax advantages of a partnership.

Robert C. Scheinfeld, Baker & Botts, L.L.P., of New York, New York, for amicus curiae Mastercard International Service. With him on the brief was Lawrence T. Kass. Of counsel on the brief for amicus curiae VISA International Service Association were Laurie [**2] S. Hane, Donald S. Chisum, and Alan L. Durham, Morrison & Foerster LLP, of Palo Alto, California.

JUDGES: Before RICH, PLAGER, and BRYSON, Circuit Judges.

State Street and Signature are both in the business of acting as custodians and accounting agents for multi-

tiered partnership fund financial services. State Street negotiated with Signature for a license to use its patented data processing system described and claimed in the '056 patent. When negotiations broke down, State Street brought a declaratory judgment action asserting invalidity, unenforceability, and noninfringement in Massachusetts district court, and then filed a motion for partial summary judgment of patent invalidity for failure to claim statutory subject matter under § 101. The motion was granted and this appeal followed.

DISCUSSION

On appeal, we are not bound [**4] to give deference to the district court's grant of summary judgment, but must make an independent determination that the standards for summary judgment have been met. *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1560, 19 U.S.P.Q.2D (BNA) 1111, 1114 (Fed. Cir. 1991). Summary judgment is properly granted where there are no genuine issues of material fact and the moving party is entitled to judgment as a matter of law. Fed. R. Civ. P. 56(c). The substantive issue at hand, whether the '056 patent is invalid for failure to claim statutory subject matter under § 101, is a matter of both claim construction and statutory construction. "We review claim construction de novo including any allegedly fact-based questions relating to claim construction." *Cybor Corp. v. FAS Techs.*, 138 F.3d 1448, 1451, 46 U.S.P.Q.2D (BNA) 1169, 1174 (Fed. Cir. 1998) (in banc). We also review statutory construction de novo. See *Romero v. United States*, 38 F.3d 1204, 1207 (Fed. Cir. 1994). We hold that declaratory judgment plaintiff State Street was not entitled to the grant of summary judgment of invalidity of the '056 patent under § 101 as a matter of law, because the patent claims are directed to statutory [**5] subject matter.

The following facts pertinent to the statutory subject matter issue are either undisputed or represent the version alleged by the nonmovant. See *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 255, 91 L. Ed. 2d 202, 106 S. Ct. 2505 (1986). The patented invention relates generally to a system that allows an administrator to monitor and record the financial information flow and make all calculations necessary for maintaining a partner fund financial services configuration. As previously mentioned, a partner fund financial services configuration essentially allows several mutual funds, or "Spokes," to pool their investment funds into a single portfolio, or "Hub," allowing for consolidation of, inter alia, the costs of administering the fund combined with the tax advantages of a partnership. In particular, this system provides means for a daily allocation of assets for two or more Spokes that are invested in the same Hub. The system determines the percentage share that each Spoke maintains in the Hub, while taking into consideration daily

changes both in the value of the Hub's investment securities and in the concomitant amount of each Spoke's assets.

In determining [**6] daily changes, the system also allows for the allocation among the Spokes of the Hub's daily income, expenses, and net realized and unrealized gain or loss, calculating each day's total investments based on the concept of a book capital account. This enables the determination of a true asset value of each Spoke and accurate calculation of allocation ratios between or among the Spokes. The system additionally tracks all the relevant data determined on a daily basis for the Hub and each Spoke, so that aggregate year end income, expenses, and capital gain or loss can be determined for accounting and for tax purposes for the Hub and, as a result, for each publicly traded Spoke.

It is essential that these calculations are quickly and accurately performed. In large part this is required because each Spoke sells shares to the public and the price of those shares is substantially based on the Spoke's percentage interest in the portfolio. In some instances, a mutual fund administrator is required to calculate the value of the shares to the nearest penny within as little as an hour and a half after the market closes. Given the complexity of the calculations, a computer or equivalent device [**7] is a virtual necessity to perform the task.

The '056 patent application was filed 11 March 1991. It initially contained six "machine" claims, which incorporated means-plus-function clauses, and six method claims. According to Signature, during prosecution the examiner contemplated a § 101 rejection for failure to claim statutory subject matter. However, upon cancellation of the six method claims, the examiner issued a notice of allowance for the remaining present six claims on appeal. Only claim 1 is an independent claim.

The district court began its analysis by construing the claims to be directed to a process, with each "means" clause merely representing a step in that process. However, "machine" claims having "means" clauses may only be reasonably viewed as process claims if there is no supporting structure in the written description that corresponds to the claimed "means" elements. See *In re Alappat*, 33 F.3d 1526, 1540-41, 31 U.S.P.Q.2D (BNA) 1545, 1554 (Fed. Cir. 1994) (in banc). This is not the case now before us.

When independent claim 1 is properly construed in accordance with § 112, P 6, it is directed to a machine, as demonstrated below, where representative claim 1 is [**8] set forth, the subject matter in brackets stating the structure the written description discloses as corresponding to the respective "means" recited in the claims.

1. A data processing system for managing a financial services configuration of a portfolio established as a partnership, each partner being one of a plurality of funds, comprising:

(a) computer processor means [a personal computer including a CPU] for processing data;

(b) storage means [a data disk] for storing data on a storage medium;

(c) first means [an arithmetic logic circuit configured to prepare the data disk to magnetically store selected data] for initializing the storage medium;

(d) second means [an arithmetic logic circuit configured to retrieve information from a specific file, calculate incremental increases or decreases based on specific input, allocate the results on a percentage basis, and store the output in a [*1372] separate file] for processing data regarding assets in the portfolio and each of the funds from a previous day and data regarding increases or decreases in each of the funds, [sic, funds'] assets and for allocating the percentage share that each fund holds in the [*9] portfolio;

(e) third means [an arithmetic logic circuit configured to retrieve information from a specific file, calculate incremental increases and decreases based on specific input, allocate the results on a percentage basis and store the output in a separate file] for processing data regarding daily incremental income, expenses, and net realized gain or loss for the portfolio and for allocating such data among each fund;

(f) fourth means [an arithmetic logic circuit configured to retrieve information from a specific file, calculate incremental increases and decreases based on specific input, allocate the results on a percentage basis and store the output in a separate file] for processing data regarding daily net unrealized gain or loss for the portfolio and for allocating such data among each fund;

(g) fifth means [an arithmetic logic circuit configured to retrieve information from specific files, calculate that information on an aggregate basis and store the output in a separate file] for processing data regarding aggregate year-end income, expenses, and capital gain or loss for the portfolio and each of the funds.

Each claim component, recited [**10] as a "means" plus its function, is to be read, of course, pursuant to § 112, P 6, as inclusive of the "equivalents" of the structures disclosed in the written description portion of the specification. Thus, claim 1, properly construed, claims a machine, namely, a data processing system for managing a financial services configuration of a portfolio established as a partnership, which machine is made up of, at the very least, the specific structures disclosed in the written description and corresponding to the means-plus-function elements (a)-(g) recited in the claim. A "machine" is proper statutory subject matter under § 101. We note that, for the purposes of a § 101 analysis, it is of little relevance whether claim 1 is directed to a "machine" or a "process," as long as it falls within at least one of the four enumerated categories of patentable subject matter, "machine" and "process" being such categories.

This does not end our analysis, however, because the court concluded that the claimed subject matter fell into one of two alternative judicially-created exceptions to statutory subject matter. n1 The court refers to the first exception as the "mathematical algorithm" exception [**11] and the second exception as the "business method" exception. Section 101 reads:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The plain and unambiguous meaning of § 101 is that any invention falling within one of the four stated categories of statutory subject matter may be patented, provided it meets the other requirements for patentability set forth in Title 35, i.e., those found in § § 102, 103, and 112, P2. n2

n1 Indeed, although we do not make this determination here, the judicially created excep-

149 F.3d 1368, *; 1998 U.S. App. LEXIS 16869, **;
47 U.S.P.Q.2D (BNA) 1596

tions, i.e., abstract ideas, laws of nature, etc., should be applicable to all categories of statutory subject matter, as our own precedent suggests. See *Alappat*, 33 F.3d at 1542, 31 U.S.P.Q.2D (BNA) at 1556; see also *In re Johnston*, 502 F.2d 765, 183 U.S.P.Q. (BNA) 172 (CCPA 1974) (Rich, J., dissenting).

n2 As explained in *In re Bergy*, 596 F.2d 952, 960, 201 U.S.P.Q. (BNA) 352, 360 (CCPA 1979) (emphases and footnote omitted):

The first door which must be opened on the difficult path to patentability is § 101....The person approaching that door is an inventor, whether his invention is patentable or not....Being an inventor or having an invention, however, is no guarantee of opening even the first door. What kind of an invention or discovery is it? In dealing with the question of kind, as distinguished from the qualitative conditions which make the invention patentable, § 101 is broad and general; its language is: "any * * * process, machine, manufacture, or composition of matter, or any * * * improvement thereof." Section 100(b) further expands "process" to include "art or method, and * * * a new use of a known process, machine, manufacture, composition of matter, or material." If the invention, as the inventor defines it in his claims (pursuant to § 112, second paragraph), falls into any one of the named categories, he is allowed to pass through to the second door, which is § 102; "novelty and loss of right to patent" is the sign on it. Notwithstanding the words "new and useful" in § 101, the invention is not examined under that statute for novelty because that is not the statutory scheme of things or the long-established administrative practice.

be obtained beyond those specifically recited in § 101. Indeed, the Supreme Court has acknowledged that Congress intended § 101 to extend to "anything under the sun that is made by man." *Diamond v. Chakrabarty*, 447 U.S. 303, 309, 65 L. Ed. 2d 144, 100 S. Ct. 2204 (1980); see also *Diamond v. Diehr*, 450 U.S. 175, 182, 67 L. Ed. 2d 155, 101 S. Ct. 1048 (1981). n3 Thus, it is improper to read limitations into § 101 on the subject matter that may be patented where the legislative history indicates that Congress clearly did not intend such limitations. See *Chakrabarty*, 447 U.S. at 308 ("We have also cautioned that courts 'should not read into the patent laws limitations and conditions which the legislature has not expressed.'" (citations omitted)).

n3 The Committee Reports accompanying the 1952 Act inform us that Congress intended statutory subject matter to "include anything under the sun that is made by man." S. Rep. No. 82-1979 at 5 (1952); H.R. Rep. No. 82-1923 at 6 (1952).

[**13]

The "Mathematical Algorithm" Exception

The Supreme Court has identified three categories of subject matter that are unpatentable, namely "laws of nature, natural phenomena, and abstract ideas." *Diehr*, 450 U.S. at 185. Of particular relevance to this case, the Court has held that mathematical algorithms are not patentable subject matter to the extent that they are merely abstract ideas. See *Diehr*, 450 U.S. 175, 67 L. Ed. 2d 155, 101 S. Ct. 1048, passim; *Parker v. Flook*, 437 U.S. 584, 57 L. Ed. 2d 451, 98 S. Ct. 2522 (1978); *Gottschalk v. Benson*, 409 U.S. 63, 34 L. Ed. 2d 273, 93 S. Ct. 253 (1972). In *Diehr*, the Court explained that certain types of mathematical subject matter, standing alone, represent nothing more than abstract ideas until reduced to some type of practical application, i.e., "a useful, concrete and tangible result." *Alappat*, 33 F.3d at 1544, 31 U.S.P.Q.2D (BNA) at 1557. n4

n4 This has come to be known as the mathematical algorithm exception. This designation has led to some confusion, especially given the Freeman-Walter-Abele analysis. By keeping in mind that the mathematical algorithm is unpatentable only to the extent that it represents an abstract idea, this confusion may be ameliorated.

[**12]

[*1373] The repetitive use of the expansive term "any" in § 101 shows Congress's intent not to place any restrictions on the subject matter for which a patent may

[**14]

149 F.3d 1368, *; 1998 U.S. App. LEXIS 16869, **;
47 U.S.P.Q.2D (BNA) 1596

Unpatentable mathematical algorithms are identifiable by showing they are merely abstract ideas constituting disembodied concepts or truths that are not "useful." From a practical standpoint, this means that to be patentable an algorithm must be applied in a "useful" way. In *Alappat*, we held that data, transformed by a machine through a series of mathematical calculations to produce a smooth waveform display on a rasterizer monitor, constituted a practical application of an abstract idea (a mathematical algorithm, formula, or calculation), because it produced "a useful, concrete and tangible result"--the smooth waveform.

Similarly, in *Arrhythmia Research Technology Inc. v. Corazonix Corp.*, 958 F.2d 1053, 22 U.S.P.Q.2D (BNA) 1033 (Fed. Cir. 1992), we held that the transformation of electrocardiograph signals from a patient's heartbeat by a machine through a series of mathematical calculations constituted a practical application of an abstract idea (a mathematical algorithm, formula, or calculation), because it corresponded to a useful, concrete or tangible thing--the condition of a patient's heart.

Today, we hold that the transformation of data, representing discrete dollar amounts, [**15] by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces "a useful, concrete and tangible result"--a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades.

The district court erred by applying the Freeman-Walter-Abele test to determine whether the claimed subject matter was an unpatentable abstract idea. The Freeman-Walter-Abele test was designed by the Court [*1374] of Customs and Patent Appeals, and subsequently adopted by this court, to extract and identify unpatentable mathematical algorithms in the aftermath of *Benson* and *Flook*. See *In re Freeman*, 573 F.2d 1237, 197 U.S.P.Q. (BNA) 464 (CCPA 1978) as modified by *In re Walter*, 618 F.2d 758, 205 U.S.P.Q. (BNA) 397 (CCPA 1980). The test has been thus articulated:

First, the claim is analyzed to determine whether a mathematical algorithm is directly or indirectly recited. Next, if a mathematical algorithm is found, the claim as a whole is further analyzed to determine whether the algorithm is "applied" [**16] in any manner to physical elements or process steps," and, if it is, it "passes muster under § 101."

In re Pardo, 684 F.2d 912, 915, 214 U.S.P.Q. (BNA) 673, 675-76 (CCPA 1982) (citing *In re Abele*, 684 F.2d 902, 214 U.S.P.Q. (BNA) 682 (CCPA 1982)). n5

n5 The test has been the source of much confusion. In *In re Abele*, 684 F.2d 902, 214 U.S.P.Q. (BNA) 682 (CCPA 1982), the CCPA upheld claims applying "a mathematical formula within the context of a process which encompasses significantly more than the algorithm alone." *Id.* at 909. Thus, the CCPA apparently inserted an additional consideration--the significance of additions to the algorithm. The CCPA appeared to abandon the application of the test in *In re Taner*, 681 F.2d 787, 214 U.S.P.Q. (BNA) 678 (CCPA 1982), only to subsequently "clarify" that the Freeman-Walter-Abele test was simply not the exclusive test for detecting unpatentable subject matter. *In re Meyer*, 688 F.2d 789, 796, 215 U.S.P.Q. (BNA) 193, 199 (CCPA 1982).

After *Diehr* and *Chakrabarty*, the Freeman-Walter-Abele [**17] test has little, if any, applicability to determining the presence of statutory subject matter. As we pointed out in *Alappat*, 33 F.3d at 1543, 31 U.S.P.Q.2D (BNA) at 1557, application of the test could be misleading, because a process, machine, manufacture, or composition of matter employing a law of nature, natural phenomenon, or abstract idea is patentable subject matter even though a law of nature, natural phenomenon, or abstract idea would not, by itself, be entitled to such protection. n6 The test determines the presence of, for example, an algorithm. Under *Benson*, this may have been a sufficient indicium of nonstatutory subject matter. However, after *Diehr* and *Alappat*, the mere fact that a claimed invention involves inputting numbers, calculating numbers, outputting numbers, and storing numbers, in and of itself, would not render it nonstatutory subject matter, unless, of course, its operation does not produce a "useful, concrete and tangible result." *Alappat*, 33 F.3d at 1544, 31 U.S.P.Q.2D (BNA) at 1557. n7 After all, as we have repeatedly stated,

every step-by-step process, be it electronic or chemical or mechanical, involves an algorithm in the broad sense of the term. [**18] Since § 101 expressly includes processes as a category of inventions which may be patented and §

100(b) further defines the word "process" as meaning "process, art or [*1375] method, and includes a new use of a known process, machine, manufacture, composition of matter, or material," it follows that it is no ground for holding a claim is directed to nonstatutory subject matter to say it includes or is directed to an algorithm. This is why the proscription against patenting has been limited to mathematical algorithms

In re Iwahashi, 888 F.2d 1370, 1374, 12 U.S.P.Q.2D (BNA) 1908, 1911 (Fed. Cir. 1989) (emphasis in the original). n8

n6 See e.g. *Parker v. Flook*, 437 U.S. 584, 590, 57 L. Ed. 2d 451, 98 S. Ct. 2522 (1978) ("[A] process is not unpatentable simply because it contains a law of nature or a mathematical algorithm."); *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130, 92 L. Ed. 588, 68 S. Ct. 440 (1948) ("He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law to a new and useful end."); *Mackay Radio & Tel. Co. v. Radio Corp. of Am.*, 306 U.S. 86, 94, 83 L. Ed. 506, 59 S. Ct. 427 (1939) ("While a scientific truth, or the mathematical expression of it, is not a patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be.").

When a claim containing a mathematical formula implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (e.g., transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101.

Diehr, 450 U.S. at 192; see also *In re Iwahashi*, 888 F.2d 1370, 1375, 12 U.S.P.Q.2D (BNA) 1908, 1911 (Fed. Cir. 1989); *Taner*, 681 F.2d at 789, 214 U.S.P.Q. (BNA) at 680. The dispositive inquiry is whether the claim as a whole is directed to statutory subject matter. It is irrelevant that a claim may contain, as part of the whole, subject matter which would not be patentable by itself. "A claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula, computer program or digital computer." *Diehr*, 450 U.S. at 187.

[**19]

n7 As the Supreme Court expressly stated in *Diehr*, its own holdings in *Benson* and *Flook* "stand for no more than these long-established principles" that abstract ideas and natural phenomena are not patentable. *Diehr*, 450 U.S. at 185 (citing *Chakrabarty*, 447 U.S. at 309 and *Funk Bros.*, 333 U.S. at 130.).

n8 In *In re Pardo*, 684 F.2d 912 (CCPA 1982), the CCPA narrowly limited "mathematical algorithm" to the execution of formulas with given data. In the same year, in *In re Meyer*, 688 F.2d 789, 215 U.S.P.Q. (BNA) 193 (CCPA 1982), the CCPA interpreted the same term to include any mental process that can be represented by a mathematical algorithm. This is also the position taken by the PTO in its Examination Guidelines, 61 Fed. Reg. 7478, 7483 (1996).

The question of whether a claim encompasses statutory subject matter should not focus on which of the four categories of subject matter a claim is directed to n9 -- process, machine, manufacture, or composition of matter--but rather on the essential characteristics of the subject matter, in particular, its practical utility. [**20] Section 101 specifies that statutory subject matter must also satisfy the other "conditions and requirements" of Title 35, including novelty, nonobviousness, and adequacy of disclosure and notice. See *In re Warmerdam*, 33 F.3d 1354, 1359, 31 U.S.P.Q.2D (BNA) 1754, 1757-58 (Fed. Cir. 1994). For purpose of our analysis, as noted above, claim 1 is directed to a machine programmed with the Hub and Spoke software and admittedly produces a "useful, concrete, and tangible result." *Alappat*, 33 F.3d at 1544, 31 U.S.P.Q.2D (BNA) at 1557. This renders it statutory subject matter, even if the useful result is expressed in numbers, such as price, profit, percentage, cost, or loss.

n9 Of course, the subject matter must fall into at least one category of statutory subject matter.

The Business Method Exception

As an alternative ground for invalidating the '056 patent under § 101, the court relied on the judicially-created, so-called "business method" exception to statutory subject matter. We take this opportunity to lay this ill-conceived [**21] exception to rest. Since its inception, the "business method" exception has merely represented the application of some general, but no longer applicable legal principle, perhaps arising out of the "requirement for invention"--which was eliminated by § 103. Since the 1952 Patent Act, business methods have been, and should have been, subject to the same legal requirements for patentability as applied to any other process or method. n10

n10 As Judge Newman has previously stated,

[The business method exception] is . . . an unwarranted encumbrance to the definition of statutory subject matter in section 101, that [should] be discarded as error-prone, redundant, and obsolete. It merits retirement from the glossary of section 101. . . . All of the "doing business" cases could have been decided using the clearer concepts of Title 35. Patentability does not turn on whether the claimed method does "business" instead of something else, but on whether the method, viewed as a whole, meets the requirements of patentability as set forth in Sections 102, 103, and 112 of the Patent Act.

In re Schrader, 22 F.3d 290, 298, 30 U.S.P.Q.2D (BNA) 1455, 1462 (Fed. Cir. 1994) (Newman, J., dissenting).

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The business method exception has never been invoked by this court, or the CCPA, to deem an invention

unpatentable. n11 Application of this particular exception has always been preceded by a ruling based on some clearer concept of Title 35 or, more commonly, application of the abstract idea exception based on finding a mathematical algorithm. Illustrative is the CCPA's analysis in *In re Howard*, 55 C.C.P.A. 1121, 394 F.2d 869, 157 U.S.P.Q. (BNA) 615 (CCPA 1968), wherein the court affirmed the Board of Appeals' rejection of the claims for lack of novelty and found it unnecessary to reach the Board's section 101 ground that a method of doing business is "inherently unpatentable." 394 F.2d at 872, 157 U.S.P.Q. (BNA) at 617. n12

n11 See Rinaldo Del Gallo, III, *Are 'Methods of Doing Business' Finally out of Business as a Statutory Rejection?*, 38 IDEA 403, 435 (1998).

n12 See also *Dann v. Johnston*, 425 U.S. 219, 47 L. Ed. 2d 692, 96 S. Ct. 1393 (1976) (the Supreme Court declined to discuss the section 101 argument concerning the computerized financial record-keeping system, in view of the Court's holding of patent invalidity under section 103); *In re Chatfield*, 545 F.2d 152, 157, 191 U.S.P.Q. (BNA) 730, 735 (CCPA 1976); *Ex parte Murray*, 9 U.S.P.Q.2D (BNA) 1819, 1820 (Bd. Pat. App. & Interf. 1988) ("The claimed accounting method [requires] no more than the entering, sorting, debiting and totaling of expenditures as necessary preliminary steps to issuing an expense analysis statement. . . .") states grounds of obviousness or lack of novelty, not of non-statutory subject matter.

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[*1376] Similarly, *In re Schrader*, 22 F.3d 290, 30 U.S.P.Q.2D (BNA) 1455 (Fed. Cir. 1994), while making reference to the business method exception, turned on the fact that the claims implicitly recited an abstract idea in the form of a mathematical algorithm and there was no "transformation or conversion of subject matter representative of or constituting physical activity or objects." 22 F.3d at 294, 30 U.S.P.Q.2D (BNA) at 1459 (emphasis omitted). n13

n13 Any historical distinctions between a method of "doing" business and the means of carrying it out blur in the complexity of modern business systems. See *Paine, Webber, Jackson & Curtis v. Merrill Lynch*, 564 F. Supp. 1358, 218 U.S.P.Q. (BNA) 212 (D. Del. 1983), (holding a computerized system of cash management was held to be statutory subject matter.)

State Street argues that we acknowledged the validity of the business method exception in *Alappat* when we discussed *Maucorps* and *Meyer*:

Maucorps dealt with a business methodology for deciding how salesmen should best [**24] handle respective customers and *Meyer* involved a 'system' for aiding a neurologist in diagnosing patients. Clearly, neither of the alleged 'inventions' in those cases falls within any § 101 category.

Alappat, 33 F.3d at 1541, 31 U.S.P.Q.2D (BNA) at 1555. However, closer scrutiny of these cases reveals that the claimed inventions in both *Maucorps* and *Meyer* were rejected as abstract ideas under the mathematical algorithm exception, not the business method exception. See *In re Maucorps*, 609 F.2d 481, 484, 203 U.S.P.Q. (BNA) 812, 816 (CCPA 1979); *In re Meyer*, 688 F.2d 789, 796, 215 U.S.P.Q. (BNA) 193, 199 (CCPA 1982).
n14

n14 Moreover, these cases were subject to the Benson era Freeman-Walter-Abele test--in other words, analysis as it existed before *Diehr* and *Alappat*.

Even the case frequently cited as establishing the business method exception to statutory subject matter, *Hotel Security Checking Co. v. Lorraine Co.*, 160 F. 467 (2d Cir. 1908), did not rely on the exception to strike the patent. [**25] n15 In that case, the patent was found invalid for lack of novelty and "invention," not because it was improper subject matter for a patent. The court stated "the fundamental principle of the system is as old as the art of bookkeeping, i.e., charging the goods of the employer to the agent who takes them." *Id.* at 469. "If at the time of [the patent] application, there had been no system of bookkeeping of any kind in restaurants, we would be confronted with the question whether a new and useful system of cash registering and account checking is such an art as is patentable under the statute." *Id.* at 472.

n15 See also *Loew's Drive-In Theatres v. Park-In Theatres*, 174 F.2d 547, 552 (1st Cir.

1949) (holding that the means for carrying out the system of transacting business lacked "an exercise of the faculty of invention"); *In re Patton*, 29 C.C.P.A. 982, 127 F.2d 324, 327-38 (CCPA 1942) (finding claims invalid as failing to define patentable subject matter over the references of record.); *Berardini v. Tocci*, 190 F. 329, 332 (C.C.S.D.N.Y. 1911); *In re Wait*, 22 C.C.P.A. 822, 73 F.2d 982, 983 (CCPA 1934) ("Surely these are, and always have been, essential steps in all dealings of this nature, and even conceding, without holding, that some methods of doing business might present patentable novelty, we think such novelty is lacking here."); *In re Howard*, 55 C.C.P.A. 1121, 157 U.S.P.Q. (BNA) 615, 617, 394 F.2d 869 (CCPA 1968) ("We therefore affirm the decision of the Board of Appeals on the ground that the claims do not define a novel process...[so we find it] unnecessary to consider the issue of whether a method of doing business is inherently unpatentable."). Although a clearer statement was made in *In re Patton*, 29 C.C.P.A. 982, 127 F.2d 324, 327, 53 U.S.P.Q. (BNA) 376, 379 (CCPA 1942) that a system for transacting business, separate from the means for carrying out the system, is not patentable subject matter, the jurisprudence does not require the creation of a distinct business class of unpatentable subject matter.

[**26]

This case is no exception. The district court announced the precepts of the business method exception as set forth in several treatises, but noted as its primary reason for finding the patent invalid under the business method exception as follows:

If Signature's invention were patentable, any financial institution desirous of implementing a multi-tiered funding complex modelled (sic) on a Hub and Spoke configuration would be required to seek Signature's permission before embarking on [*1377] such a project. This is so because the '056 Patent is claimed [sic] sufficiently broadly to foreclose virtually any computer-implemented accounting method necessary to manage this type of financial structure.

149 F.3d 1368, *; 1998 U.S. App. LEXIS 16869, **;
47 U.S.P.Q.2D (BNA) 1596

927 F. Supp. 502, 516, 38 U.S.P.Q.2D (BNA) 1530, 1542 (emphasis added). Whether the patent's claims are too broad to be patentable is not to be judged under § 101, but rather under § § 102, 103 and 112. Assuming the above statement to be correct, it has nothing to do with whether what is claimed is statutory subject matter.

In view of this background, it comes as no surprise that in the most recent edition of the Manual of Patent Examining Procedures (MPEP) (1996), a paragraph of § [**27] 706.03(a) was deleted. In past editions it read:

Though seemingly within the category of process or method, a method of doing business can be rejected as not being within the statutory classes. See *Hotel Security Checking Co. v. Lorraine Co.*, 160 F. 467 (2nd Cir. 1908) and *In re Wait*, 73 F.2d 982, 24 U.S.P.Q. (BNA) 88, 22 C.C.P.A. 822 (1934).

MPEP § 706.03(a) (1994). This acknowledgment is buttressed by the U.S. Patent and Trademark 1996 Examina-

tion Guidelines for Computer Related Inventions which now read:

Office personnel have had difficulty in properly treating claims directed to methods of doing business. Claims should not be categorized as methods of doing business. Instead such claims should be treated like any other process claims.

Examination Guidelines, 61 Fed. Reg. 7478, 7479 (1996). We agree that this is precisely the manner in which this type of claim should be treated. Whether the claims are directed to subject matter within § 101 should not turn on whether the claimed subject matter does "business" instead of something else.

CONCLUSION

The appealed decision is reversed and the case is remanded to the district court for further proceedings [**28] consistent with this opinion.

REVERSED and REMANDED.

IN THE MATTER OF THE APPLICATION OF PETER P. TOMA

No. 77-554

UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

575 F.2d 872; 1978 CCPA LEXIS 300; 197 U.S.P.Q. (BNA) 852

May 18, 1978, Decided

PRIOR HISTORY: [**1]

Serial No. 176,672.

JUDGES:

Markey, Chief Judge, Rich, Baldwin, Lane and Miller, Associate Judges.

OPINIONBY:

BALDWIN

OPINION: [*873]

BALDWIN, Judge

This appeal is from the decision of the Patent and Trademark Office (PTO) Board of Appeals (board), modified on reconsideration, sustaining the rejection of claims 1-13, 15-24, 26, 28-36, 40, 41 and 43-56 n1 under 35 [*874] U.S.C. 101 as being directed to nonstatutory subject matter. We reverse the rejection of all claims.

n1 In application serial No. 176,672, filed August 31, 1971, for "Method Using a Programmed Digital Computer System for Translation Between Natural Languages."

The Invention

The invention involves a method of operating a digital computer to translate from a source natural language, e.g., Russian, to a target natural language, e.g., English. The method involves three phases. The dictionary look-up phase establishes the target language meaning of each word in the source text. The syntactical analysis phase identifies syntactical [**2] information from the inflection of the word and the position of the word in the

source text. The synthesis phase takes the meaning and syntactical information of all of the words of a sentence in the source text and forms a sentence in the target language.

More specifically, the method begins by loading the source text into the memory of a computer. Each source text word is then transformed into a converted source text word. The converted source text word consists of the source text word and coded information. The coded information may include a memory offset address linkage which provides access to a memory location that contains syntactical information and translation for the source text word. The converted source text words which derive from a source text sentence are then synthesized into a target language translation of that sentence. The synthesis correctly establishes both word meaning and word position in the target language sentence.

An important aspect of the invention is the separate treatment given high frequency versus low frequency words. In order to maximize the effective capacity of the core memory of the computer, the low frequency words carry their translation [**3] information along with them, while each of the high frequency words carries a memory offset address linkage which allows easy access to its translation information which is stored in the core memory. Thus, the translation information for frequently used words is held in an easily accessible place in the computer rather than along with every occurrence of the word as is done for low frequency words.

While the above description portrays a human analogy of how the claimed invention functions, it must be understood that, in fact, the actual operation of the process by the computer is quite different. From the time that the source text is converted to machine-readable input data until the time that the machine-readable output data is converted to human-readable translation text, the

claimed process proceeds under the control of a computer program. While it is convenient to describe the steps of the program as if they were being performed by a human translator, in fact, nothing of the kind is happening. Rather, the computer is carrying out a series of unthinking, abstract mathematical operations on the abstract values stored in the memory of the computer. The program functions independently [**4] of the meaning or significance of the data on which it is acting. The fact that the program is formed in a high level programming language, which makes the program appear to give significance to the machine operation, does not change the fact that the machine is actually carrying out a series of abstract steps which have nothing to do with translating between natural languages. If a different kind of information were fed into the computer, the program used in this invention could conceivably perform a function totally different from translating.

Various claims of appellant recite activity by which information is extracted from the computer. Claims 32 and 36 include "printing out the translation." Claim 51 recites the step "converting the target language sequence from computer intelligible binary coded signals back to visual indicia."

Claims 52 and 53 limit the "converting" step of claim 51 to "printing." Claim 54 recites the step of "converting the proper target language sequence from computer intelligible binary coded signals back to visual indicia." Claims 55 and 56 limit the "converting" step in claim 54 to "printing."

The following claims are representative: [*875] [**5]

1. A method for translation between source and target natural languages using a program-mable digital computer system, the steps comprising:

(a) storing in a main memory of the computer system a source text to be translated;

(b) scanning and comparing such stored source text words with dictionaries of source language words stored in a memory and for each such source text word for which a match is found, storing in a file in main memory each word and in association with each such word, coded information derived from such dictionary for use in translation of such word, the coded information including memory offset address linkages to a memory in the computer system where grammar and target language translations for the word are stored;

(c) analyzing the source text words in its file of words, a complete sentence at a time, and converting the same into a sentence in the target language utilizing the coded information and including the steps of

(1) utilizing the memory offset address linkages for obtaining the target [sic language] translations of words from a memory; and

(2) recording the target language translation into the proper target language sequence.

32. A method, [**6] according to claim 1, including the steps of analyzing a sequence of words in the source language within phrases and clauses in relation to the target language word sequence, the target language word sequence being expressed symbolically by assigned numbers and printing out the translation taking into consideration each source word.

51. A method for translation between source and target natural languages using a programmable digital computer system, the steps comprising:

(a) converting a source text to be translated from visual indicia to computer intelligible binary coded signals;

(b) storing in a main memory of the computer system the converted source text to be translated;

(c) scanning and comparing such converted source text words with dictionaries of source language words stored in a memory and for each source text word for which a match is found, storing in a file in main memory each word and [sic in] association with each such word, coded information derived from such dictionary for use in translation of such word, the coded information including memory offset address linkages to a memory in the computer system where grammar and target language translations for the [**7] word are stored;

(d) analyzing the converted source text words in the file of words, a complete sentence at a time, and converting the same into a sentence in the target language utilizing the coded information and including the steps of

(1) utilizing the memory offset address linkages for obtaining the target language translations of words from a memory; and

(2) reordering the target language translation into the proper target language sequence;

(e) converting the target language sequence from computer intelligible binary coded signals back to visual indicia.

52. The method of claim 51 wherein the last step of converting comprises the step of printing.

The Board

The opinion of the board states that the claimed method is not statutory subject matter under 35 U.S.C. § 101.n2 The board's position is based on its reading of

Gottschalk v. Benson, 409 U.S. 63, 93 S. Ct. 253, 34 L. Ed. 2d 273, 175 U.S.P.Q. 673 (1972), and its [*876] reading of our early interpretation of Benson in *In re Christensen*, 478 F.2d 1392, 178 U.S.P.Q. 35 (CCPA 1973). Appellant's claimed invention is, according to the board, an algorithm or rule having no substantial practical application except [**8] in connection with a digital computer. The board quoted Benson for the proposition that such inventions are not patentable subject matter. n3 Though the board did recognize that appellant's algorithm is far more complex than that which was examined in Benson, the board found that Benson expressed no limitations on the nature, extent, or complexity of unpatentable algorithms.

n2 35 U.S.C. § 101 provides:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

n3 The board cited the "nutshell" holding in Benson:

It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting binary code to pure binary were patented in this case. The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself." [409 U.S. at 71-72, 175 U.S.P.Q. at 676.]

[**9]

On reconsideration, the board considered a very broad, dictionary definition of "algorithm" n4 and concluded that the term is not limited to expressions in mathematical terms but rather includes expressions in natural language. The board argued that the apparent absence of any mathematical notation or activity in appellant's claims did not distinguish appellant's claims from the subject matter in Benson.

n4 The board took the following definition from C. Sippl and C. Sippl, *Computer Dictionary and Handbook* 23 (2d ed. 1972):

algorithm 1. A fixed step-by-step procedure for accomplishing a given result; usually a simplified procedure for solving a complex problem, also a full statement of a finite number of steps. 2. A defined process or set of rules that leads and assures development of a desired output from a given input. A sequence of formulas and/or algebraic/logical steps to calculate or determine a given task; processing rules.

The board also cited Christensen in support of its application [**10] of Benson to this case. n5 The only difference the board found between the prior art computer translation method, Oettinger, n6 and the claimed invention was a novel algorithm. The board read Christensen for the proposition that such a difference is not sufficient to render a process statutory.

n5 The board focused on the following passage in Christensen:

The issue before us in the instant case is also a narrow one, namely, is a method claim in which the point of novelty is a mathematical equation to be solved as the final step of the method, a statutory method? We follow the Supreme Court in concluding that the answer is in the negative. [478 F.2d at 1394, 178 U.S.P.Q. at 37.]

n6 A. Oettinger, *Automatic Language Translation* (Harvard Monographs in Applied Science No. 8 1960). Oettinger describes a computer-based dictionary which forms a literal, word-for-word translation.

OPINION

We must begin by resolving the question whether appellant's Notice of Appeal was sufficient to give us jurisdiction [**11] over all of the claims which appellant is trying to bring before us. Appellant's Notice of Appeal contained sixteen reasons. Six of the reasons expressly refer to fewer than all of the appealed claims. The remainder of the reasons contain no express reference to particular claims and focus on board positions that relate to all of the claims. The PTO does not allege that it was misled by the Notice. Therefore, we hold that this Notice of Appeal is sufficient to give us jurisdiction over all of the claims which appellant has attempted to bring before us. *In re Schwarze*, 536 F.2d 1373, 190 U.S.P.Q. 294 (CCPA 1976).

We reject the board's analysis based on Christensen. Even if the only novel aspect of this invention were an algorithm, it is not proper to decide the question of statu-

575 F.2d 872, *, 1978 CCPA LEXIS 300, **;
197 U.S.P.Q. (BNA) 852

tory subject matter by focusing on less than all of the claimed invention. *In re Chatfield*, 545 F.2d 152, 191 U.S.P.Q. 730 (CCPA 1976), cert. denied, 434 U.S. 875, 98 S. Ct. 226, 54 L. Ed. 2d 155, 195 U.S.P.Q. 465 (1977). [*877]

Next, we expressly recognize some questions which are not at issue in this case. The examiner and the board do not now directly question whether appellant has invented, [*12] properly claimed, and adequately disclosed a computerized method for translating between natural languages. Nor is it directly questioned whether the method is new, useful, and unobvious. The single ground of rejection articulated by the board is that the Benson holding renders the method unpatentable.

Thus, the main issue in this case is whether the claims on appeal are rendered nonstatutory by the holding in Benson.

In the process of our search for the meaning of Benson, we have defined certain classes of claims which are clearly not rendered nonstatutory by Benson. One such class covers those claims which do not directly or indirectly recite a Benson-type algorithm. *In re Freeman*, 573 F.2d 1237, 197 U.S.P.Q. (BNA) 464 (CCPA 1978).

In applying the Freeman rationale to the case before us, we begin by rejecting the board's definition of algorithm recited in note 4, supra. While we agree with the board that the form in which an "algorithm" is recited, whether algebraic or prose, is of no moment, it is clear to us that the Benson Court used the term "algorithm" in a specific sense, namely "a procedure for solving a given type of mathematical problem." 409 U.S. at 65, 93 S. [*13] Ct. 253, 34 L. Ed. 2d 273, 175 U.S.P.Q. at 674 (emphasis added). Using this definition, we have carefully examined the claims in this case and are unable to find any direct or indirect recitation of a procedure for solving a mathematical problem. n7 Translating between natural languages is not a mathematical problem as we understand the term to have been used in Benson. Nor are any of the recited steps in the claims mere procedures for solving mathematical problems. Since the claims do not directly or indirectly recite an algorithm, the claims cannot preempt an algorithm. We hold, therefore, that the claims in this appeal are not rendered nonstatutory by Benson.

n7 We do not consider the question whether the mere recitation of a step involving computer activity, but not otherwise reciting an algorithm, "indirectly recites" an algorithm. That issue was neither considered by the board nor argued before us. Furthermore, the question involves factual

inquiries which an appellate court is ill-equipped to accomplish.

[**14]

There is another issue in this case. The examiner, in his Final Rejection and in his Examiner's Answer, appears to have rejected the claims because a computerized method of translating is not, the examiner submitted, in the "technological arts." The examiner cited *In re Musgrave*, 57 CCPA 1352, 431 F.2d 882, 167 U.S.P.Q. 280 (1970); *In re Benson*, 58 CCPA 1134, 441 F.2d 682, 169 U.S.P.Q. 548 (1971), rev'd sub nom. *Gottschalk v. Benson*, 409 U.S. 63, 175 U.S.P.Q. 673 (1972); *In re McIlroy*, 58 CCPA 1249, 442 F.2d 1397, 170 U.S.P.Q. 31 (1971), for the proposition that all statutory subject matter must be in the "technological" or "useful" arts, and that, as far as computer-related inventions are concerned, only those inventions which "enhance the internal operation of the digital computer" are in the "technological" or "useful" arts. The examiner further stated that natural language translation is a "liberal art" and that effecting the translation by means of a machine does not transform the activity into a "technological art." The board's prefatory treatment of this theory of rejection did not indicate approval or disapproval of it.

First, we hold that the method for enabling a [*15] computer to translate natural languages is in the technological arts, i.e., it is a method of operating a machine. n8 The "technological" or "useful" arts inquiry must focus on whether the claimed subject matter (a method of operating a machine to translate) is statutory, not on whether the product of the claimed subject matter (a translated text) is statutory, not on whether the prior art which the claimed subject [*878] matter purports to replace (translation by human mind) is statutory, and not on whether the claimed subject matter is presently perceived to be an improvement over the prior art, e.g., whether it "enhances" the operation of a machine. This was the law prior to Benson and was not changed by Benson.

n8 The question whether all of the claims in this case actually claim a method which accomplishes a translation was not raised below and we do not consider it.

Second, the examiner has taken language from the cited cases and attempted to apply that language in a different context. *Musgrave*, [*16] *In re Benson*, and *McIlroy* all involved data processing methods useful in a computer, but not expressly limited to use in a computer. Furthermore, all of those cases involved a "mental steps" rejection. The language which the examiner has quoted

575 F.2d 872, *, 1978 CCPA LEXIS 300, **;
197 U.S.P.Q. (BNA) 852

was written in answer to "mental steps" rejections and was not intended to create a generalized definition of statutory subject matter. Moreover, it was not intended to form a basis for a new § 101 rejection as the examiner apparently suggests. To the extent that this "technologi-

cal arts" rejection is before us, independent of the rejection based on Benson, it is also reversed.

The decision of the board is reversed.

REVERSED

LEXSEE 450 US 175

DIAMOND, COMMISSIONER OF PATENTS AND TRADEMARKS v. DIEHR ET AL.

No. 79-1112

SUPREME COURT OF THE UNITED STATES

450 U.S. 175; 101 S. Ct. 1048; 67 L. Ed. 2d 155; 1981 U.S. LEXIS 73; 49 U.S.L.W. 4194; 209 U.S.P.Q. (BNA) 1

**October 14, 1980, Argued
March 3, 1981, Decided**

PRIOR HISTORY:

CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

DISPOSITION:

602 F.2d 982, affirmed.

DECISION:

Process for curing synthetic rubber employing mathematical formula and programmed digital computer, held patentable subject matter under *35 USCS 101*.

SUMMARY:

Certain individuals filed a patent application for a process for molding raw, uncured synthetic rubber into cured precision products. The individuals claimed that their process insured the production of molded articles which are properly cured. Although it is possible by using well-known time, temperature, and cure relationships to calculate by means of an established mathematical equation when to open the molding press and remove the cured product, the individuals argued that the industry had not been able to obtain uniformly accurate cures because the temperature of the press could not be precisely measured, making it difficult to do the necessary computations to determine cure time. The individuals characterized their contribution to the art as residing in the process of constantly measuring the actual temperature inside the mold, with these temperature measurements being automatically fed into a computer which recalculates the cure time by use of the mathematical equation and ultimately signals a device to open the press at the correct moment. Concluding that the individuals' claims defined and sought protection of a computer pro-

gram, the patent examiner rejected those claims on the sole ground that they were drawn to nonstatutory subject matter under *35 USCS 101*, which provides for the issuance of patents to whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof. The Patent and Trademark Office Board of Appeals agreed with the examiner, but the United States Court of Customs and Patent Appeals reversed, noting that a claim drawn to subject matter otherwise statutory does not become nonstatutory because a computer is involved (*602 F.2d 982*).

On certiorari, the United States Supreme Court affirmed. In an opinion by Rehnquist, J., joined by Burger, Ch. J., and Stewart, White, and Powell, JJ., it was held that the physical and chemical process for molding precision synthetic rubber products fell within the categories of subject matter eligible for patent protection under *35 USCS 101*, and this result was not altered by the fact that in several steps of the process a mathematical equation and programmed digital computer were used, since (1) no attempt was being made to preempt the use of the equation but only to foreclose others from the use of that equation in conjunction with all of the other steps in the claimed process, and (2) use of the computer in the process did not render the process as a whole unpatentable subject matter in view of the fact that the computer was used to achieve a result previously unknown in the art, the fact that one or more of the steps in the process might not, in isolation, be novel or independently eligible for patent protection being irrelevant to the question of whether the claims as a whole recited subject matter eligible for patent protection under 101.

Stevens, J., joined by Brennan, Marshall, and Blackmun, JJ., dissenting, expressed the view that no program-related invention is a patentable process under

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

35 USCS 101 unless it makes a contribution to the art that is not dependent entirely on the utilization of a computer, and therefore the invention claimed in the patent application at issue in the case at bar, which made no contribution that was not entirely dependent upon the utilization of a computer in a familiar process, was not patentable subject matter.

LAWYERS' EDITION HEADNOTES:

[***LEdHN1]

PATENTS § 45

rubber curing process -- use of computer and mathematical formula -- patentability --

Headnote:[1A][1B][1C][1D][1E]

A physical and chemical process for molding precision synthetic rubber products falls within the categories of subject matter eligible for patent protection under 35 USCS 101--which provides for the issuance of patents to whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof--and this result is not altered by the fact that in several steps of the process an established mathematical equation and programmed digital computer are used, where (1) no attempt is made to preempt the use of the equation but only to foreclose others from the use of that equation in conjunction with all of the other steps in the claimed process, and (2) use of the computer in the process does not render the process as a whole unpatentable subject matter in view of the fact that the computer is employed to achieve a result previously unknown in the art, the fact that one or more of the steps in the process might not, in isolation, be novel or independently eligible for patent protection being irrelevant to the question of whether the claim as a whole recites subject matter eligible for patent protection under 101. (Stevens, Brennan, Marshall, and Blackmun, JJ., dissented from this holding.)

[***LEdHN2]

STATUTES § 164

statutory construction -- language of statute -- common meaning --

Headnote:[2]

In cases of statutory construction, courts the place to begin is the language of the statute, and words, unless otherwise defined, will be interpreted as taking their ordinary, contemporary, common meaning.

[***LEdHN3]

PATENTS § 16

laws of nature -- physical phenomena -- ideas --
Headnote:[3]

35 USCS 101, which governs the issuance of patents, does not embrace every discovery, and excluded from such patent protection are laws of nature, physical phenomena and abstract ideas; neither an idea, an abstract principle, an original cause, nor a motive can be patented.

[***LEdHN4]

PATENTS § 16

mathematical formula -- computer program -- digital computer --

Headnote:[4]

With regard to 35 USCS 101, which governs the issuance of patents, a claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula, computer program or digital computer.

[***LEdHN5]

PATENTS § 45

scientific truth -- mathematical formula -- patentability -

-
Headnote:[5]

While a scientific truth, or the mathematical expression of it, is not a patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be; an application of a law of nature or mathematical formula to an known structure or process may well be deserving of patent protection.

[***LEdHN6]

PATENTS § 45

phenomenon of nature -- invention -- "product" claim -- "process" claim --

Headnote:[6A][6B]

The principle that the discoverer of a previously unknown phenomenon of nature has no claim to a monopoly over that discovery which is recognized by law, and that any invention from that discovery must come from the application of the law of nature to a new and useful end, applies both to a "product" claim and to a "process" claim.

[***LEdHN7]

PATENTS § 45

mathematical equation -- rubber curing process -- patentability --

Headnote:[7]

While Arrhenius' equation for calculating the cure time in rubber molding presses is not patentable in isolation,

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

when a process for curing rubber is devised which incorporates it in a more efficient solution of the equation, that process is at the very least not barred at the threshold by 35 USCS 101, which governs the issuance of patents.

[***LEdHN8]
PATENTS § 45
process claim -- eligibility for patent protection --
Headnote:[8]

In determining the eligibility of a claimed process for patent protection under 35 USCS 101, claims must be considered as a whole, and it is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis, and this is particularly true in a process claim because a new combination of steps in the process may be patentable even though all the constituents of the combination were well known and in common use years before the combination was made; the "novelty" of any element or steps in the process, or even of the process itself, is of no relevance in determining whether the subject matter of a claim falls within the categories of possibly patentable subject matter under 101.

[***LEdHN9]
PATENTS § 45
mathematical algorithm -- patentability --
Headnote:[9A][9B]

With regard to the eligibility of a claimed process involving a mathematical algorithm for patent protection under 35 USCS 101, which governs the issuance of patents, the fact that everything other than the algorithm is determined to be old in the art does not necessarily prevent the claim from reciting statutory subject matter.

[***LEdHN10]
PATENTS § 16
novelty of particular invention -- eligibility for patent protection --
Headnote:[10]

The question whether a particular invention is novel is fully apart from whether the invention falls into a category of statutory subject matter eligible for patent protection under 35 USCS 101.

[***LEdHN11]
PATENTS § 45
patent claim -- mathematical formula -- post-solution activity --
Headnote:[11]

When a claim recites a mathematical formula (or scientific principle or phenomenon of nature), an inquiry must be made into whether the claim is seeking patent protection for that formula in the abstract, since a mathematical formula as such is not accorded the protection of the patent laws, and this principle cannot be circumvented by attempting to limit the use of the formula to a particular technological environment; similarly, insignificant post-solution activity does not transform an unpatentable principle into a patentable process.

[***LEdHN12]
PATENTS § 45
mathematical formula -- patentable subject matter --
Headnote:[12A][12B]

A mathematical formula does not suddenly become patentable subject matter simply by having the applicant acquiesce to limiting the reach of the patent for the formula to a particular technological use, and a mathematical formula in the abstract is nonstatutory subject matter regardless of whether the patent is intended to cover all uses of the formula or only limited uses, just as a formula does not become patentable subject matter merely by including in the claim for the formula token post-solution activity; however when a claim containing a mathematical formula implements or applies that formula in a structure or process which, considered as a whole, is performing a function which patent laws were designed to protect (for example, transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of 35 USCS 101, which governs the issuance of patents.

[***LEdHN13]
PATENTS § 16
process -- novelty -- patentable subject matter --
Headnote:[13A][13B]

In determining whether a claimed process is patentable subject matter under 35 USCS 101, which governs the issuance of patents, one should not read out of the patent application all of the steps in the claimed process which are not novel or "inventive" since that is not the purpose of the 101 inquiry, and to do so would conflict with the proposition that a claimed invention may be entitled to patent protection even though some or all of its elements are not "novel."

SYLLABUS:

Respondents filed a patent application claiming invention for a process for molding raw, uncured synthetic rubber into cured precision products. While it was possible, by using well-known time, temperature, and cure relationships, to calculate by means of an established

450 U.S. 175, *, 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

mathematical equation when to open the molding press and remove the cured product, according to respondents the industry had not been able to measure precisely the temperature *inside* the press, thus making it difficult to make the necessary computations to determine the proper cure time. Respondents characterized their contribution to the art to reside in the process of constantly measuring the temperature inside the mold and feeding the temperature measurements into a computer that repeatedly recalculates the cure time by use of the mathematical equation and then signals a device to open the press at the proper time. The patent examiner rejected respondents' claims on the ground that they were drawn to nonstatutory subject matter under 35 U. S. C. § 101, which provides for the issuance of patents to "[whoever] invents or discovers any new and useful *process*, machine, manufacture, or composition of matter, or any new and useful improvement thereof" The Patent and Trademark Office Board of Appeals agreed, but the Court of Customs and Patent Appeals reversed.

Held: Respondents' claims recited subject matter that was eligible for patent protection under § 101. Pp. 181-193.

(a) For purposes of § 101, a "process" is "an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. . . . The machinery pointed out as suitable to perform the process may or may not be new or patentable." *Cochrane v. Deener*, 94 U.S. 780, 788. Industrial processes such as respondents' claims for transforming raw, uncured synthetic rubber into a different state or thing are the types which have historically been eligible to receive patent-law protection. Pp. 181-184.

(b) While a mathematical formula, like a law of nature, cannot be the subject of a patent, cf. *Gottschalk v. Benson*, 409 U.S. 63; *Parker v. Flook*, 437 U.S. 584, respondents do not seek to patent a mathematical formula, but instead seek protection for a process of curing synthetic rubber. Although their process employs a well-known mathematical equation, they do not seek to preempt the use of that equation, except in conjunction with all of the other steps in their claimed process. A claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula, computer program, or digital computer. Respondents' claims must be considered as a whole, it being inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis. The questions of whether a particular invention meets the "novelty" requirements of 35 U. S. C. § 102 or the "nonobviousness" requirements of § 103 do not affect the determination of whether the invention

falls into a category of subject matter that is eligible for patent protection under § 101. Pp. 185-191.

(c) When a claim containing a mathematical formula implements or applies the formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (e. g., transforming or reducing an article to a different state or thing), then the claim satisfies § 101's requirements. Pp. 191-193.

COUNSEL:

Deputy Solicitor General Wallace argued the cause for petitioner. With him on the briefs were Solicitor General McCree, Assistant Attorney General Litvack, Harriet S. Shapiro, Robert B. Nicholson, Frederic Freilicher, Joseph F. Nakamura, and Thomas E. Lynch.

Robert E. Wichersham argued the cause for respondents. With him on the brief were Robert F. Hess, Jay M. Cantor, and Thomas M. Freiburger. *

* Edward S. Irons, Mary Helen Sears, and Robert P. Beshar filed a brief for National Semiconductor Corp. as amicus curiae urging reversal.

Briefs of amici curiae urging affirmance were filed by Donald R. Dunner, Kenneth E. Kuffner, and Travis Gordon White for the American Patent Law Association, Inc.; by Morton C. Jacobs for Applied Data Research, Inc.; by William L. Mathis and Harold D. Messner for Chevron Research Co.; and by Reed C. Lawlor and James W. Geriak for the Los Angeles Patent Law Association.

JUDGES:

REHNQUIST, J., delivered the opinion of the Court, in which BURGER, C. J., and STEWART, WHITE, and POWELL, JJ., joined. STEVENS, J., filed a dissenting opinion, in which BRENNAN, MARSHALL, and BLACKMUN, JJ., joined, post, p. 193.

OPINIONBY:

REHNQUIST

OPINION:

[*177] [***160] [**1052] JUSTICE REHNQUIST delivered the opinion of the Court.

[***LEdHR1A] [1A]We granted certiorari to determine whether a process for curing synthetic rubber which includes in several of its steps the use of a mathematical

formula and a programmed digital computer is patentable subject matter under 35 U. S. C. § 101.

I

The patent application at issue was filed by the respondents on August 6, 1975. The claimed invention is a process for molding raw, uncured synthetic rubber into cured precision products. The process uses a mold for precisely shaping the uncured material under heat and pressure and then curing the synthetic rubber in the mold so that the product will retain its shape and be functionally operative after the molding is completed. n1

n1 A "cure" is obtained by mixing curing agents into the uncured polymer in advance of molding, and then applying heat over a period of time. If the synthetic rubber is cured for the right length of time at the right temperature, it becomes a usable product.

Respondents claim that their process ensures the production of molded articles which are properly cured. Achieving the perfect cure depends upon several factors including the thickness of the article to be molded, the temperature of the molding process, and the amount of time that the article is allowed to remain in the press. It is possible using well-known time, temperature, and cure relationships to calculate by means of the Arrhenius equation n2 when to open the press [*178] and remove the cured product. Nonetheless, according to the respondents, the industry has not been able to obtain uniformly accurate cures because the temperature of the molding press could not be precisely measured, thus making it difficult to do the necessary computations to determine cure time. n3 Because the temperature *inside* the press has heretofore been viewed as an uncontrollable variable, the conventional industry practice has been to calculate the cure time as the shortest time in which all parts of the product will [***161] definitely be cured, assuming a reasonable amount of mold-opening time during loading and unloading. But the shortcoming of this practice is that operating with an uncontrollable variable inevitably led in some instances to overestimating the mold-opening time and overcuring the rubber, and in other instances to underestimating that time and undercuring the product. n4

n2 The equation is named after its discoverer Svante Arrhenius and has long been used to calculate the cure time in rubber-molding presses. The equation can be expressed as follows:

$$\ln v <v1>equ CZ+x$$

wherein $\ln v$ is the natural logarithm of v , the total required cure time; C is the activation constant, a unique figure for each batch of each compound being molded, determined in accordance with rheometer measurements of each batch; Z is the temperature in the mold; and x is a constant dependent on the geometry of the particular mold in the press. A rheometer is an instrument to measure flow of viscous substances.

n3 During the time a press is open for loading, it will cool. The longer it is open, the cooler it becomes and the longer it takes to reheat the press to the desired temperature range. Thus, the time necessary to raise the mold temperature to curing temperature is an unpredictable variable. The respondents claim to have overcome this problem by continuously measuring the actual temperature in the closed press through the use of a thermocouple.

n4 We note that the petitioner does not seriously contest the respondents' assertions regarding the inability of the industry to obtain accurate cures on a uniform basis. See Brief for Petitioner 3.

Respondents characterize their contribution to the art to reside in the process of constantly measuring the actual temperature inside the mold. These temperature [**1053] measurements are then automatically fed into a computer which repeatedly recalculates the cure time by use of the Arrhenius equation. [*179] When the recalculated time equals the actual time that has elapsed since the press was closed, the computer signals a device to open the press. According to the respondents, the continuous measuring of the temperature inside the mold cavity, the feeding of this information to a digital computer which constantly recalculates the cure time, and the signaling by the computer to open the press, are all new in the art.

The patent examiner rejected the respondents' claims on the sole ground that they were drawn to nonstatutory subject matter under 35 U. S. C. § 101. n5 He determined [***162] that those [*180] steps in respondents' claims that are carried out by a computer under control of a stored program constituted nonstatutory subject matter under this Court's decision in *Gottschalk v. Benson*, 409 U.S. 63 (1972). The remaining [**1054] steps -- installing rubber in the press and the subsequent closing of the [*181] press -- were "conventional and necessary to the process and cannot be the basis of patentability." The examiner concluded that respondents' claims defined

and sought protection of a computer program for operating a rubber-molding press.

n5 Respondents' application contained 11 different claims. Three examples are claims 1, 2, and 11 which provide:

"1. A method of operating a rubber-molding press for precision molded compounds with the aid of a digital computer, comprising:

"providing said computer with a data base for said press including at least,

"natural logarithm conversion data (ln),

"the activation energy constant (C) unique to each batch of said compound being molded, and

"a constant (x) dependent upon the geometry of the particular mold of the press,

"initiating an interval timer in said computer upon the closure of the press for monitoring the elapsed time of said closure,

"constantly determining the temperature (Z) of the mold at a location closely adjacent to the mold cavity in the press during molding,

"constantly providing the computer with the temperature (Z),

"repetitively calculating in the computer, at frequent intervals during each cure, the Arrhenius equation for reaction time during the cure, which is

$$\ln v < v1 > \text{equ } CZ + x$$

"where v is the total required cure time,

"repetitively comparing in the computer at said frequent intervals during the cure each said calculation of the total required cure time calculated with the Arrhenius equation and said elapsed time, and

"opening the press automatically when a said comparison indicates equivalence.

"2. The method of claim 1 including measuring the activation energy constant for the compound being molded in the press with a rheometer and automatically updating said data base within the computer in the event of changes in the compound being molded in said press as measured by said rheometer.

....

"11. A method of manufacturing precision molded articles from selected synthetic rubber compounds in an openable rubber molding press having at least one heated precision mold, comprising:

"(a) heating said mold to a temperature range approximating a predetermined rubber curing temperature,

"(b) installing prepared unmolded synthetic rubber of a known compound in a molding cavity of predetermined geometry as defined by said mold,

"(c) closing said press to mold said rubber to occupy said cavity in conformance with the contour of said mold and to cure said rubber by transfer of heat thereto from said mold,

"(d) initiating an interval timer upon the closure of said press for monitoring the elapsed time of said closure,

"(e) heating said mold during said closure to maintain the temperature thereof within said range approximating said rubber curing temperature,

"(f) constantly determining the temperature of said mold at a location closely adjacent said cavity thereof throughout closure of said press,

"(g) repetitively calculating at frequent periodic intervals throughout closure of said press the Arrhenius equation for reaction time of said rubber to determine total required cure time v as follows:

$$\ln v < v1 > \text{equ } cz + x$$

"wherein c is an activation energy constant determined for said rubber being molded and cured in said press, z is the temperature of said mold at the time of each calculation of said Arrhenius equation, and x is a constant which is a function of said predetermined geometry of said mold,

"(h) for each repetition of calculation of said Arrhenius equation herein, comparing the resultant calculated total required cure time with the monitored elapsed time measured by said interval timer,

"(i) opening said press when a said comparison of calculated total required cure time and monitored elapsed time indicates equivalence, and

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

"(j) removing from said mold the resultant precision molded and cured rubber article."

The Patent and Trademark Office Board of Appeals agreed with the examiner, but the Court of Customs and Patent Appeals reversed. *In re Diehr*, 602 F.2d 982 (1979). The court noted that a claim drawn to subject matter otherwise statutory does not become nonstatutory because a computer is involved. The respondents' claims were not directed to a mathematical algorithm or an improved method of calculation but rather recited an improved process for molding rubber articles by solving a practical problem which had arisen in the molding of rubber products.

The Commissioner of Patents and Trademarks sought certiorari arguing that the decision of the Court of Customs and Patent Appeals was inconsistent with prior decisions of this Court. Because of the importance of the question presented, we granted the writ. 445 U.S. 926 (1980).

II

Last Term in *Diamond v. Chakrabarty*, 447 U.S. 303 (1980), this Court discussed the historical purposes of the patent laws and in particular 35 U. S. C. § 101. As in *Chakrabarty*, we must here construe 35 U. S. C. § 101 which provides:

"Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." n6

n6 The word "process" is defined in 35 U. S. C. § 100 (b):

"The term 'process' means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material."

[*182]

***LEDHR2 [2] In cases of statutory construction, we begin with the language of ***163 the statute. Unless otherwise defined, "words will be interpreted as taking their ordinary, contemporary, common meaning," *Perrin v. United States*, 444 U.S. 37, 42 (1979), and, in dealing with the patent laws, we have more than once cautioned that "courts 'should not read into the patent laws limitations and conditions which the legislature has not expressed.'" *Diamond v. Chakrabarty*, *supra*, at 308, quot-

ing *United States v. Dubilier Condenser Corp.*, 289 U.S. 178, 199 (1933).

The Patent Act of 1793 defined statutory subject matter as "any new and useful art, machine, manufacture or composition of matter, or any new or useful improvement [thereof]." Act of Feb. 21, 1793, ch. 11, § 1, 1 Stat. 318. Not until the patent laws were recodified in 1952 did Congress replace the word "art" with the word "process." It is that latter word which we confront today, and in order to determine its meaning we may not be unmindful of the Committee Reports accompanying the 1952 Act which inform us that Congress intended statutory subject matter to "include anything under the sun that is made by man." S. Rep. No. 1979, 82d Cong., 2d Sess., 5 (1952); H. R. Rep. No. 1923, 82d Cong., 2d Sess., 6 (1952).

Although the term "process" was not added to 35 U. S. C. § 101 until 1952, a process has historically enjoyed patent protection because it was considered a form of "art" as that term was used in the 1793 Act. n7 In defining the nature of a patentable process, the Court stated:

***164 [*1055] "That a process may be patentable, irrespective of the [*183] particular form of the instrumentalities used, cannot be disputed. . . . A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. In the language of the patent law, it is an art. The machinery pointed out as suitable to perform the process may or may not be new or patentable; whilst the process itself may be altogether new, and produce an entirely new result. The process requires [*184] that certain things should be done with certain substances, and in a certain order; but the tools to be used in doing this may be of secondary consequence." *Cochrane v. Deener*, 94 U.S. 780, 787-788 (1877).

n7 In *Corning v. Burden*, 15 How. 252, 267-268 (1854), this Court explained:

"A process, *eo nomine*, is not made the subject of a patent in our act of congress. It is included under the general term 'useful art.' An art may require one or more processes or machines in order to produce a certain result or manufacture. The term machine includes every mechanical device or combination of mechanical powers and devices to perform some function and produce a certain effect or result. But where the result or effect is produced by chemical action, by the operation or application of some element or power of nature, or of one substance to another,

450 U.S. 175, *, 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

such modes, methods, or operations, are called processes. A new process is usually the result of discovery; a machine, of invention. The arts of tanning, dyeing, making water-proof cloth, vulcanizing India rubber, smelting ores, and numerous others, are usually carried on by processes as distinguished from machines. One may discover a new and useful improvement in the process of tanning, dyeing, &c., irrespective of any particular form of machinery or mechanical device. And another may invent a labor-saving machine by which this operation or process may be performed, and each may be entitled to his patent. As, for instance, A has discovered that by exposing India rubber to a certain degree of heat, in mixture or connection with certain metallic salts, he can produce a valuable product, or manufacture; he is entitled to a patent for his discovery, as a process or improvement in the art, irrespective of any machine or mechanical device. B, on the contrary, may invent a new furnace or stove, or steam apparatus, by which this process may be carried on with much saving of labor, and expense of fuel; and he will be entitled to a patent for his machine, as an improvement in the art. Yet A could not have a patent for a machine, or B for a process; but each would have a patent for the means or method of producing a certain result, or effect, and not for the result or effect produced. It is for the discovery or invention of some practical method or means of producing a beneficial result or effect, that a patent is granted, and not for the result or effect itself. It is when the term process is used to represent the means or method of producing a result that it is patentable, and it will include all methods or means which are not effected by mechanism or mechanical combinations."

Analysis of the elibility of a claim of patent protection for a "process" did not change with the addition of that term to § 101. Recently, in *Gottschalk v. Benson*, 409 U.S. 63 (1972), we repeated the above definition recited in *Cochrane v. Deener*, adding: "Transformation and reduction of an article 'to a different state or thing' is the clue to the patentability of a process claim that does not include particular machines." 409 U.S., at 70.

[***LEdHR1B] [1B]Analyzing respondents' claims according to the above statements from our cases, we think that a physical and chemical process for molding precision synthetic rubber products falls within the § 101 categories of possibly patentable subject matter. That respondents' claims involve the transformation of an article, in this case raw, uncured synthetic rubber, into a

different state or thing cannot be disputed. The respondents' claims describe in detail a step-by-step method for accomplishing such, beginning with the loading of a mold with raw, uncured rubber and ending with the eventual opening of the press at the conclusion of the cure. Industrial processes such as this are the types which have historically been eligible to receive the protection of our patent laws. n8

n8 We note that as early as 1854 this Court approvingly referred to patent eligibility of processes for curing rubber. See *id.*, at 267; n. 7, *supra*. In *Tilghman v. Proctor*, 102 U.S. 707 (1881), we referred to the original patent Charles Goodyear received on his process for "vulcanizing" or curing rubber. We stated:

"That a patent can be granted for a process, there can be no doubt. The patent law is not confined to new machines and new compositions of matter, but extends to any new and useful art or manufacture. A manufacturing process is clearly an art, within the meaning of the law. Goodyear's patent was for a process, namely, the process of vulcanizing india-rubber by subjecting it to a high degree of heat when mixed with sulphur and a mineral salt. The apparatus for performing the process was not patented, and was not material. The patent pointed out how the process could be effected, and that was deemed sufficient." *Id.*, at 722.

[*185] III

[**1056]

[***LEdHR3] [3]Our conclusion regarding respondents' claims is not altered by the fact that in several steps of the process a mathematical equation and a programmed digital computer are used. This Court has undoubtedly recognized limits to § 101 and every discovery is not embraced within the statutory terms. Excluded from such patent protection are laws of nature, natural phenomena, and [***165] abstract ideas. See *Parker v. Flook*, 437 U.S. 584 (1978); *Gottschalk v. Benson*, *supra*, at 67; *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948). "An idea of itself is not patentable," *Rubber-Tip Pencil Co. v. Howard*, 20 Wall. 498, 507 (1874). "A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right." *Le Roy v. Tatham*, 14 How. 156, 175 (1853). Only last Term, we explained:

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

"[A] new mineral discovered in the earth or a new plant found in the wild is not patentable subject matter. Likewise, Einstein could not patent his celebrated law that $E=mc^2$; nor could Newton have patented the law of gravity. Such discoveries are 'manifestations of . . . nature, free to all men and reserved exclusively to none.'" *Diamond v. Chakrabarty*, 447 U.S., at 309, quoting *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, *supra*, at 130.

Our recent holdings in *Gottschalk v. Benson*, *supra*, and *Parker v. Flook*, *supra*, both of which are computer-related, stand for no more than these long-established principles. In *Benson*, we held unpatentable claims for an algorithm used to convert binary code decimal numbers to equivalent pure binary numbers. The sole practical application of the algorithm was in connection with the programming of a [*186] general purpose digital computer. We defined "algorithm" as a "procedure for solving a given type of mathematical problem," and we concluded that such an algorithm, or mathematical formula, is like a law of nature, which cannot be the subject of a patent. n9

n9 The term "algorithm" is subject to a variety of definitions. The petitioner defines the term to mean:

"1. A fixed step-by-step procedure for accomplishing a given result; usually a simplified procedure for solving a complex problem, also a full statement of a finite number of steps. 2. A defined process or set of rules that leads [*sic*] and assures development of a desired output from a given input. A sequence of formulas and/or algebraic/logical steps to calculate or determine a given task; processing rules." Brief for Petitioner in *Diamond v. Bradley*, O. T. 1980, No. 79-855, p. 6, n. 12, quoting C. Sippl & R. Sippl, *Computer Dictionary and Handbook* 23 (2d ed. 1972).

This definition is significantly broader than the definition this Court employed in *Benson* and *Flook*. Our previous decisions regarding the patentability of "algorithms" are necessarily limited to the more narrow definition employed by the Court, and we do not pass judgment on whether processes falling outside the definition previously used by this Court, but within the definition offered by the petitioner, would be patentable subject matter.

Parker v. Flook, *supra*, presented a similar situation. The claims were drawn to a method for computing an "alarm limit." An "alarm limit" is simply a number

and the Court concluded that the application sought to protect a formula for computing this number. Using this formula, the updated alarm limit could be calculated if several other variables were known. The application, however, did not purport to explain how these other variables were to be determined, n10 nor [*187] did it purport "to contain [***166] [**1057] any disclosure relating to the chemical processes at work, the monitoring of process variables, or the means of setting off an alarm or adjusting an alarm system. All that it provides is a formula for computing an updated alarm limit." 437 U.S., at 586.

n10 As we explained in *Flook*, in order for an operator using the formula to calculate an updated alarm limit the operator would need to know the original alarm base, the appropriate margin of safety, the time interval that should elapse between each updating, the current temperature (or other process variable), and the appropriate weighing factor to be used to average the alarm base and the current temperature. 437 U.S., at 586. The patent application did not "explain how to select the approximate margin of safety, the weighing factor, or any of the other variables." *Ibid*.

[***LEdHR1C] [1C] In contrast, the respondents here do not seek to patent a mathematical formula. Instead, they seek patent protection for a process of curing synthetic rubber. Their process admittedly employs a well-known mathematical equation, but they do not seek to pre-empt the use of that equation. Rather, they seek only to foreclose from others the use of that equation in conjunction with all of the other steps in their claimed process. These include installing rubber in a press, closing the mold, constantly determining the temperature of the mold, constantly recalculating the appropriate cure time through the use of the formula and a digital computer, and automatically opening the press at the proper time. Obviously, one does not need a "computer" to cure natural or synthetic rubber, but if the computer use incorporated in the process patent significantly lessens the possibility of "overcuring" or "undercuring," the process as a whole does not thereby become unpatentable subject matter.

[***LEdHR4] [4] [***LEdHR5] [5] [***LEdHR6A] [6A] Our earlier opinions lend support to our present conclusion that a claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula, computer program,

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

or digital computer. In *Gottschalk v. Benson* we noted: "It is said that the decision precludes a patent for any program servicing a computer. We do not so hold." 409 U.S., at 71. Similarly, in *Parker v. Flook* we stated that "a process is not unpatentable simply because it contains a law of nature or a mathematical algorithm." 437 U.S., at 590. It is now commonplace that an application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection. See, e. g., *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127 (1948); *Eibel Process Co. v. Minnesota & Ontario Paper Co.*, 261 U.S. 45 (1923); *Cochrane v. Deener*, 94 U.S. 780 (1877); *O'Reilly v. Morse*, 15 How. 62 (1854); and *Le Roy v. Tatham*, 14 How. 156 (1853). As Justice Stone explained four decades ago:

"While a scientific truth, or the mathematical expression of it, is not a patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be." *Mackay Radio & Telegraph Co. v. Radio Corp. of America*, 306 U.S. 86, 94 (1939). n11

[***LEdHR6B] [6B]

n11 We noted in *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948):

"He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end."

Although we were dealing with a "product" claim in *Funk Bros.*, the same principle applies to a process claim. *Gottschalk v. Benson*, 409 U.S. 63, 68 (1972).

[***LEdHR7] [7]We [***167] think this statement in *Mackay* takes us a long way toward the correct answer in this case. Arrhenius' equation is not patentable in isolation, but when a process for curing rubber is devised which incorporates in it a more efficient solution of the equation, that process is at the very least not barred at the threshold by § 101.

[***LEdHR8] [8] [***LEdHR9A] [9A]In determining the eligibility of respondents' claimed process for patent protection under § 101, their claims must be [**1058] considered as a whole. It is inappropriate to dissect the claims into old and new elements and then to ignore the

presence of the old elements in the analysis. This is particularly true in a process claim because a new combination of steps in a process may be patentable even though all the constituents of the combination were well known and in common use before the combination was made. The "novelty" of any element or steps in a process, or even of the [*189] process itself, is of no relevance in determining whether the subject matter of a claim falls within the § 101 categories of possibly patentable subject matter. n12

[***LEdHR9B] [9B]

n12 It is argued that the procedure of dissecting a claim into old and new elements is mandated by our decision in *Flook* which noted that a mathematical algorithm must be assumed to be within the "prior art." It is from this language that the petitioner premises his argument that if everything other than the algorithm is determined to be old in the art, then the claim cannot recite statutory subject matter. The fallacy in this argument is that we did not hold in *Flook* that the mathematical algorithm could not be considered at all when making the § 101 determination. To accept the analysis proffered by the petitioner would, if carried to its extreme, make all inventions unpatentable because all inventions can be reduced to underlying principles of nature which, once known, make their implementation obvious. The analysis suggested by the petitioner would also undermine our earlier decisions regarding the criteria to consider in determining the eligibility of a process for patent protection. See, e. g., *Gottschalk v. Benson*, *supra*; and *Cochrane v. Deener*, 94 U.S. 780 (1877).

[***LEdHR10] [10]It has been urged that novelty is an appropriate consideration under § 101. Presumably, this argument results from the language in § 101 referring to any "new and useful" process, machine, etc. Section 101, however, is a general statement of the type of subject matter that is eligible for patent protection "subject to the conditions and requirements of this title." Specific conditions for patentability follow and § 102 covers in detail the conditions relating to novelty. n13 [*190] The question [***168] therefore of whether a particular invention is novel is "wholly apart from whether the invention falls into a category of statutory subject matter." *In re Bergy*, 596 F.2d 952, 961 (CCPA 1979) (emphasis deleted). See also *Nickola v. Peterson*, 580 F.2d 898 (CA6 1978). The legislative history of the 1952 Patent

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

Act is in accord with this reasoning. The Senate Report stated:

Section 101 sets forth the subject matter that can be patented, 'subject to the conditions and requirements of this title.' The conditions under which a patent may be obtained follow, and *Section 102 covers the conditions relating to novelty.*" S. Rep. No. 1979, 82d Cong., 2d Sess., 5 [**1059] (1952) (emphasis supplied).

It is later stated in the same Report:

"Section 102, in general, may be said to describe the statutory novelty required for patentability, and includes, [*191] in effect, an amplification and definition of 'new' in section 101." *Id.*, at 6.

Finally, it is stated in the "Revision Notes":

"The corresponding section of [the] existing statute is split into two sections, section 101 relating to the subject matter for which patents may be obtained, and section 102 defining statutory novelty and stating other conditions for patentability." *Id.*, at 17.

See also H. R. Rep. No. 1923, 82d Cong., 2d Sess., 6, 7, and 17 (1952).

n13 Section 102 is titled "Conditions for patentability; novelty and loss of right to patent," and provides:

"A person shall be entitled to a patent unless

"(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

"(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or

"(c) he has abandoned the invention, or

"(d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or inventor's certificate filed more than twelve months before the filing of the application in the United States, or

"(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371 (c) of this title before the invention thereof by the applicant for patent, or

"(f) he did not himself invent the subject matter sought to be patented, or

"(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other."

In this case, it may later be determined that the respondents' process is not deserving of patent protection because it fails to satisfy the statutory conditions of novelty under § 102 or nonobviousness under § 103. A rejection on either of these grounds does not affect the determination that respondents' claims recited subject matter which was eligible for patent protection under § 101.

IV

[**LEdHR1D] [1D] [**LEdHR11] [11]
[**LEdHR12A] [12A] [**LEdHR13A] [13A] We have before us today only the question of whether respondents' claims fall within the § 101 categories of possibly patentable subject matter. We view respondents' claims as nothing more than a process for molding rubber products and not as an attempt to patent a mathematical formula. We recognize, of course, that when a claim recites a mathematical formula (or scientific principle or phenomenon of nature), an inquiry must be made into whether the claim is seeking patent protection for that formula in the abstract. A mathematical formula as such is not accorded the protection of our patent laws, *Gottschalk v. Benson*, 409 U.S. 63 (1972), and this principle cannot be circumvented by attempting to limit the use of the formula to a particular technological environment. *Parker v. Flook*, 437 U.S. 584 (1978). Similarly, insignificant postsolution activity will not transform [*192] an unpatentable principle into a patentable [**169] process. *Ibid.* n14 To hold otherwise would allow a competent draftsman to evade the recognized limitations on the type of subject matter eligible for pat-

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

ent protection. On the other hand, when a claim containing a mathematical formula implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (*e. g.*, transforming or reducing an article to a different [**1060] state or thing), then the claim satisfies the requirements of § 101. Because we do not view respondents' claims as an attempt to patent a mathematical formula, but rather to be drawn to an industrial process [*193] for the molding of rubber products, we affirm the judgment of the Court of Customs and Patent Appeals. n15

[***LEdHR12B] [12B]

n14 Arguably, the claims in *Flook* did more than present a mathematical formula. The claims also solved the calculation in order to produce a new number or "alarm limit" and then replaced the old number with the number newly produced. The claims covered all uses of the formula in processes "comprising the catalytic chemical conversion of hydrocarbons." There are numerous such processes in the petrochemical and oil refinery industries and the claims therefore covered a broad range of potential uses. 437 U.S., at 586. The claims, however, did not cover every conceivable application of the formula. We rejected in *Flook* the argument that because all possible uses of the mathematical formula were not pre-empted, the claim should be eligible for patent protection. Our reasoning in *Flook* is in no way inconsistent with our reasoning here. A mathematical formula does not suddenly become patentable subject matter simply by having the applicant acquiesce to limiting the reach of the patent for the formula to a particular technological use. A mathematical formula in the abstract is nonstatutory subject matter regardless of whether the patent is intended to cover all uses of the formula or only limited uses. Similarly, a mathematical formula does not become patentable subject matter merely by including in the claim for the formula token postsolution activity such as the type claimed in *Flook*. We were careful to note in *Flook* that the patent application did not purport to explain how the variables used in the formula were to be selected, nor did the application contain any disclosure relating to chemical processes at work or the means of setting off an alarm or adjusting the alarm limit. *Ibid.* All the application provided was a "formula for computing an updated alarm limit." *Ibid.*

[***LEdHR1E] [1E]

n15 The dissent's analysis rises and falls on its characterization of respondents' claims as presenting nothing more than "an improved method of calculating the time that the mold should remain closed during the curing process." *Post*, at 206-207. The dissent states that respondents claim only to have developed "a new method of programming a digital computer in order to calculate -- promptly and repeatedly -- the correct curing time in a familiar process." *Post*, at 213. Respondents' claims, however, are not limited to the isolated step of "programming a digital computer." Rather, respondents' claims describe a process of curing rubber beginning with the loading of the mold and ending with the opening of the press and the production of a synthetic rubber product that has been perfectly cured -- a result heretofore unknown in the art. See n. 5, *supra*. The fact that one or more of the steps in respondents' process may not, in isolation, be novel or independently eligible for patent protection is irrelevant to the question of whether the claims as a whole recite subject matter *eligible* for patent protection under § 101. As we explained when discussing machine patents in *Deepsouth Packing Co. v. Laitram Corp.*, 406 U.S. 518 (1972):

"The patents were warranted not by the novelty of their elements but by the novelty of the combination they represented. Invention was recognized because Laitram's assignors combined ordinary elements in an extraordinary way -- a novel union of old means was designed to achieve new ends. Thus, for both inventions 'the whole in some way [exceeded] the sum of its parts.' *Great A. & P. Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147, 152 (1950)." *Id.*, at 521-522 (footnote omitted).

[***LEdHR13B] [13B] In order for the dissent to reach its conclusion it is necessary for it to read out of respondents' patent application all the steps in the claimed process which it determined were not novel or "inventive." That is not the purpose of the § 101 inquiry and conflicts with the proposition recited above that a claimed invention may be entitled to patent protection even though some or all of its elements are not "novel."

It is so ordered.

DISSENTBY:

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

STEVENS

DISSENT:

JUSTICE [***170] STEVENS, with whom JUSTICE BRENNAN, JUSTICE MARSHALL, and JUSTICE BLACKMUN join, dissenting.

The starting point in the proper adjudication of patent litigation is an understanding of what the inventor claims [*194] to have discovered. The Court's decision in this case rests on a misreading of the Diehr and Lutton patent application. Moreover, the Court has compounded its error by ignoring the critical distinction between the character of the subject matter that the inventor claims to be novel -- the § 101 issue -- and the question whether that subject matter is in fact novel -- the § 102 issue.

I

Before discussing the major flaws in the Court's opinion, a word of history may be helpful. As the Court recognized in *Parker v. Flook*, 437 U.S. 584, 595 (1978), the computer industry is relatively young. Although computer technology seems commonplace today, the first digital computer capable of utilizing stored programs was developed less than 30 years ago. n1 Patent law developments in response to this new technology are of even more recent vintage. The subject of legal protection for computer programs did not begin to receive serious consideration until over a decade after completion of the first programmable digital computer. n2 It was 1968 before [*195] the federal [**1061] courts squarely addressed the subject, n3 and 1972 before this Court announced its first decision in the area. n4

n1 ENIAC, the first general purpose electronic digital computer, was built in 1946. Unlike modern computers, this machine was externally programmed; its circuitry had to be manually rewired each time it was used to perform a new task. See Gemignani, Legal Protection for Computer Software: The View From '79, 7 Rutgers J. Computers, Tech. & L. 269, 270 (1980). In 1952, a group of scientists at the Institute for Advanced Study completed MANIAC I, the first digital computer capable of operating upon stored programs, as opposed to hard-wired circuitry. See Ulam, Computers, 211 Scientific American 203 (1964).

n2 The subject received some scholarly attention prior to 1964. See, e. g., Seidel, Antitrust, Patent and Copyright Law Implications of Computer Technology, 44 J. Pat. Off. Soc. 116 (1962); Comment, The Patentability of Computer

Programs, 38 N. Y. U. L. Rev. 891 (1963). In 1964, the Copyright Office began registering computer programs. See 11 Copyright Soc. Bull. 361 (1964); Davis, Computer Programs and Subject Matter Patentability, 6 Rutgers J. Computers, Tech. & L. 1, 5 (1977). Also in 1964, the Patent Office Board of Appeals issued what appears to be the first published opinion concerning the patentability of a computer-related invention. See *Ex parte King*, 146 USPQ 590.

n3 *In re Prater*, 56 C. C. P. A. (Pat.) 1360, 415 F.2d 1378 (1968), modified on rehearing, 56 C. C. P. A. (Pat.) 1381, 415 F.2d 1393 (1969), is generally identified as the first significant judicial decision to consider the subject-matter patentability of computer program-related inventions. The Court of Customs and Patent Appeals earlier decided *In re Naquin*, 55 C. C. P. A. (Pat.) 1428, 398 F.2d 863 (1968), in which it rejected a challenge to an application for a patent on a program-related invention on grounds of inadequate disclosure under § 112.

n4 See *Gottschalk v. Benson*, 409 U.S. 63 (1972).

Prior to 1968, well-established principles of patent law probably would have prevented the issuance [***171] of a valid patent on almost any conceivable computer program. Under the "mental steps" doctrine, processes involving mental operations were considered unpatentable. See, e. g., *In re Heritage*, 32 C. C. P. A. (Pat.) 1170, 1173-1177, 150 F.2d 554, 556-558 (1945); *In re Shao Wen Yuan*, 38 C. C. P. A. (Pat.) 967, 972-976, 188 F.2d 377, 380-383 (1951). The mental-steps doctrine was based upon the familiar principle that a scientific concept or mere idea cannot be the subject of a valid patent. See *In re Bolongaro*, 20 C. C. P. A. (Pat.) 845, 846-847, 62 F.2d 1059, 1060 (1933). n5 The doctrine was regularly invoked to deny patents to inventions consisting primarily of mathematical formulae or methods of computation. n6 It was also applied against patent claims in which a mental operation or mathematical computation was the sole novel element or inventive contribution; it was clear that patentability [*196] could not be predicated upon a mental step. n7 Under the "function of a machine" doctrine, a process which amounted to nothing more than a description of the function of a machine was unpatentable. This doctrine had its origin in several 19th-century decisions of this Court, n8 and it had been consistently followed thereafter by the lower federal courts. n9 [*197] Finally, the definition of "process"

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

[**1062] announced by this Court in *Cochrane v. Deener*, 94 U.S. 780, 787-788 (1877), seemed to indicate that a patentable process must cause a physical transformation in the materials to which the process is applied. See *ante*, at 182-184.

n5 See also Novick & Wallenstein, *The Algorithm and Computer Software Patentability: A Scientific View of a Legal Problem*, 7 Rutgers J. Computers, Tech. & L. 313, 316-317 (1980).

n6 See, e. g., *Don Lee, Inc. v. Walker*, 61 F.2d 58, 67 (CA9 1932); *In re Bolongaro*, 20 C. C. P. A. (Pat.) 845, 846-847, 62 F.2d 1059, 1060 (1933); *In re Shao Wen Yuan*, 38 C. C. P. A. (Pat.) 967, 969-972, 188 F.2d 377, 379-380 (1951); *Lyman v. Ladd*, 120 U. S. App. D. C. 388, 389, 347 F.2d 482, 483 (1965).

n7 See, e. g., *In re Cooper*, 30 C. C. P. A. (Pat.) 946, 949, 134 F.2d 630, 632 (1943); *Halliburton Oil Well Cementing Co. v. Walker*, 146 F.2d 817, 821, 823 (CA9 1944), *rev'd* on other grounds, 329 U.S. 1 (1946); *In re Heritage*, 32 C. C. P. A. (Pat.) 1170, 1173-1177, 150 F.2d 554, 556-558 (1945); *In re Abrams*, 38 C. C. P. A. (Pat.) 945, 950-953, 188 F.2d 165, 168-170 (1951); *In re Shao Wen Yuan*, *supra*, at 975-976, 188 F.2d, at 383; *In re Lundberg*, 39 C. C. P. A. (Pat.) 971, 975, 197 F.2d 336, 339 (1952); *In re Venner*, 46 C. C. P. A. (Pat.) 754, 758-759, 262 F.2d 91, 95 (1958).

n8 The "function of a machine" doctrine is generally traced to *Corning v. Burden*, 15 How. 252, 268 (1854), in which the Court stated: "[I]t is well settled that a man cannot have a patent for the function or abstract effect of a machine, but only for the machine which produces it." The doctrine was subsequently reaffirmed on several occasions. See, e. g., *Risdon Iron & Locomotive Works v. Medart*, 158 U.S. 68, 78-79, 84 (1895); *Westinghouse v. Boyden Power Brake Co.*, 170 U.S. 537, 554-557 (1898); *Busch v. Jones*, 184 U.S. 598, 607 (1902); *Expanded Metal Co. v. Bradford*, 214 U.S. 366, 383 (1909).

n9 See, e. g., *In re Weston*, 17 App. D. C. 431, 436-442 (1901); *Chisholm-Ryder Co. v. Buck*, 65 F.2d 735, 736 (CA4 1933); *In re Ernst*, 21 C. C. P. A. (Pat.) 1235, 1238-1240, 71 F.2d 169, 171-172 (1934); *In re McCurdy*, 22 C. C. P. A. (Pat.) 1140, 1142-1145, 76 F.2d 400, 402-403,

(1935); *In re Parker*, 23 C. C. P. A. (Pat.) 721, 722-725, 79 F.2d 908, 909-910 (1935); *Black-Clawson Co. v. Centrifugal Engineering & Patents Corp.*, 83 F.2d 116, 119-120 (CA6), *cert. denied*, 299 U.S. 554 (1936); *In re Wadman*, 25 C. C. P. A. (Pat.) 936, 943-944, 94 F.2d 993, 998 (1938); *In re Mead*, 29 C. C. P. A. (Pat.) 1001, 1004, 127 F.2d 302, 304 (1942); *In re Solakian*, 33 C. C. P. A. (Pat.) 1054, 1059, 155 F.2d 404, 407 (1946); *In re Middleton*, 35 C. C. P. A. (Pat.) 1166, 1167-1168, 167 F.2d 1012, 1013-1014 (1948); *In re Nichols*, 36 C. C. P. A. (Pat.) 759, 762-763, 171 F.2d 300, 302-303 (1948); *In re Ashbaugh*, 36 C. C. P. A. (Pat.) 902, 904-905, 173 F.2d 273, 274-275 (1949); *In re Horvath*, 41 C. C. P. A. (Pat.) 844, 849-851, 211 F.2d 604, 607-608 (1954); *In re Gartner*, 42 C. C. P. A. (Pat.) 1022, 1025-1026, 223 F.2d 502, 504 (1955).

Concern [***172] with the patent system's ability to deal with rapidly changing technology in the computer and other fields led to the formation in 1965 of the President's Commission on the Patent System. After studying the question of computer program patentability, the Commission recommended that computer programs be expressly excluded from the coverage of the patent laws; this recommendation was based primarily upon the Patent Office's inability to deal with the administrative burden of examining program applications. n10 At approximately the time that the Commission issued its report, the Patent Office published notice of its intention to prescribe guidelines for the examination of applications for patents on computer programs. See 829 Off. Gaz. Pat. Off. 865 (Aug. 16, 1966). Under the proposed guidelines, a computer program, whether claimed as an apparatus or as a process, was unpatentable. n11 The Patent Office indicated, however, [*198] that a programmed computer could be a component of a patentable process if combined with unobvious elements to produce a physical result. The Patent Office formally adopted the guidelines in 1968. See 33 Fed. Reg. 15609 (1968).

n10 The Commission's report contained the following evaluation of the current state of the law with respect to computer program patentability:

"Uncertainty now exists as to whether the statute permits a valid patent to be granted on programs. Direct attempts to patent programs have been rejected on the ground of nonstatutory subject matter. Indirect attempts to obtain patents and avoid the rejection, by drafting claims as a process, or a

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

machine or components thereof programmed in a given manner, rather than as a program itself, have confused the issue further and should not be permitted." Report of the President's Commission on the Patent System, "To Promote the Progress of . . . Useful Arts" in an Age of Exploding Technology 14 (1966).

n11 The Patent Office guidelines were based primarily upon the mental-steps doctrine and the *Cochrane v. Deener*, 94 U.S. 780 (1877), definition of "process." See 829 Off. Gaz. Pat. Off. 865 (Aug. 16, 1966); 33 Fed. Reg. 15609 (1968).

The new guidelines were to have a short life. Beginning with two decisions in 1968, a dramatic change in the law as understood by the Court of Customs and Patent Appeals took place. By repudiating the well-settled "function of a machine" and "mental steps" doctrines, that court reinterpreted § 101 of the Patent Code to enlarge drastically the categories of patentable subject matter. This reinterpretation would lead to the conclusion that computer programs were within the categories of inventions to which Congress intended to extend patent protection.

In *In re Tarczy-Hornoch*, 55 C. C. P. A. (Pat.) 1441, 397 F.2d 856 (1968), a divided Court of Customs and Patent Appeals overruled the line of cases developing and applying the "function of a machine" doctrine. The majority acknowledged that the doctrine had originated with decisions of this Court and that the lower federal courts, including the Court of Customs and Patent Appeals, had consistently adhered to it during the preceding 70 years. Nonetheless, the court concluded that the doctrine rested on a misinterpretation of the precedents and that it was contrary to "the basic purposes of the patent system and productive of a range of undesirable results from the harshly inequitable to the silly." *Id.*, at 1454, 397 F.2d, [*1063] at 867. n12 [***173] Shortly thereafter, a similar [*199] fate befell the "mental steps" doctrine. In *In re Prater*, 56 C. C. P. A. (Pat.) 1360, 415 F.2d 1378 (1968), modified on rehearing, 56 C. C. P. A. (Pat.) 1381, 415 F.2d 1393 (1969), the court found that the precedents on which that doctrine was based either were poorly reasoned or had been misinterpreted over the years. 56 C. C. P. A. (Pat.), at 1366-1372, 415 F.2d, at 1382-1387. The court concluded that the fact that a process may be performed mentally should not foreclose patentability if the claims reveal that the process also may be performed without mental operations. *Id.*, at 1374-1375, 415 F.2d, at 1389. n13 This aspect of the original *Prater* opinion was substantially undisturbed by the opinion issued after rehearing. However, the second *Prater* opinion clearly indicated that patent claims broad enough to encompass the operation of a programmed

computer would not be rejected for lack of patentable subject matter. 56 C. C. P. A. (Pat.), at 1394, n. 29, 415 F.2d, at 1403, n. 29. n14

n12 Judge Kirkpatrick, joined by Chief Judge Worley, wrote a vigorous dissent objecting to the majority's decision to abandon "a rule which is about as solidly established as any rule of the patent law." 55 C. C. P. A. (Pat.), at 1457, 397 F.2d, at 868. Unlike the majority, the dissenting judges did not consider the doctrine inequitable or silly, and they observed that it had functioned in a satisfactory manner in the past. *Id.*, at 1457-1458, 397 F.2d, at 869. In addition, they considered the doctrine to be so well established that it had been adopted by implication in the Patent Act of 1952. *Id.*, at 1458, 397 F.2d, at 869.

n13 In *Prater*, the patent application claimed an improved method for processing spectrographic data. The method analyzed conventionally obtained data by using well-known equations. The inventors had discovered a particular mathematical characteristic of the equations which enabled them to select the specific subset of equations that would yield optimum results. The application disclosed an analog computer as the preferred embodiment of the invention, but indicated that a programmed digital computer could also be used. 56 C. C. P. A. (Pat.), at 1361-1363, 415 F.2d, at 1379-1380. The Patent Office had rejected the process claims on a mental-steps theory because the only novel aspect of the claimed method was the discovery of an unpatentable mathematical principle. The apparatus claim was rejected essentially because, when the mathematical principle was assumed to be within the prior art, the claim disclosed no invention entitled to patent protection. *Id.*, at 1364-1365, 1375, 415 F.2d, at 1381, 1399.

n14 It is interesting to note that the Court of Customs and Patent Appeals in the second *Prater* opinion expressly rejected the Patent Office's procedure for analyzing the apparatus claim pursuant to which the mathematical principle was treated as though it were within the prior art. 56 C. C. P. A. (Pat.), at 1397, 415 F.2d, at 1405-1406. This precise procedure, of course, was later employed by this Court in *Parker v. Flook*, 437 U.S. 584 (1978).

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

[*200] The Court of Customs and Patent Appeals soon replaced the overruled doctrines with more expansive principles formulated with computer technology in mind. In *In re Bernhart*, 57 C. C. P. A. (Pat.) 737, 417 F.2d 1395 (1969), the court reaffirmed *Prater*, and indicated that all that remained of the mental-steps doctrine was a prohibition on the granting of a patent that would confer a monopoly on all uses of a scientific principle or mathematical equation. *Id.*, at 743, 417 F.2d, at 1399. The court also announced that a computer programmed with a new and unobvious program was physically different from the same computer without that program; the programmed computer was a new machine or at least a new improvement over the unprogrammed computer. *Id.*, at 744, 417 F.2d, at 1400. Therefore, patent protection could be obtained for new computer programs if the patent claims were drafted in apparatus form.

The Court of Customs and Patent Appeals turned its attention to process claims encompassing computer programs in *In re Musgrave*, 57 C. C. P. A. (Pat.) 1352, 431 F.2d 882 (1970). In that case, the court emphasized the fact that *Prater* had done away with the mental-steps doctrine; in particular, the court rejected the Patent Office's continued reliance upon the "point of novelty" approach to [***174] claim analysis. *Id.*, at 1362, 431 F.2d, [**1064] at 889. n15 The court also announced a new standard for evaluating process claims under § 101: any sequence of operational steps was a patentable process under § 101 as long as it was within the "technological arts." *Id.*, at 1366-1367, 431 F.2d, at 893. This standard effectively disposed of any vestiges of the mental-steps doctrine remaining [*201] after *Prater* and *Bernhart*. n16 The "technological arts" standard was refined in *In re Benson*, 58 C. C. P. A. (Pat.) 1134, 441 F.2d 682 (1971), in which the court held that computers, regardless of the uses to which they are put, are within the technological arts for purposes of § 101. *Id.*, at 1142, 441 F.2d, at 688.

N15 Under the "point of novelty" approach, if the novelty or advancement in the art claimed by the inventor resided solely in a step of the process embodying a mental operation or other unpatentable element, the claim was rejected under § 101 as being directed to nonstatutory subject matter. See Blumenthal & Riter, Statutory or Non-Statutory?: An Analysis of the Patentability of Computer Related Inventions, 62 J. Pat. Off. Soc. 454, 457, 461, 470 (1980).

n16 The author of the second *Prater* opinion, Judge Baldwin, disagreed with the *Musgrave* "technological arts" standard for process claims. He described that standard as "a major and radi-

cal shift in this area of the law." 57 C. C. P. A. (Pat.), at 1367, 431 F.2d, at 893-894. As Judge Baldwin read the majority opinion, claims drawn solely to purely mental processes were now entitled to patent protection. *Id.*, at 1369, 431 F.2d, at 895-896. Judge Baldwin's understanding of *Musgrave* seems to have been confirmed in *In re Foster*, 58 C. C. P. A. (Pat.) 1001, 1004-1005, 438 F.2d 1011, 1014-1015 (1971).

In re Benson, of course, was reversed by this Court in *Gottschalk v. Benson*, 409 U.S. 63 (1972). n17 Justice Douglas' opinion for a unanimous Court made no reference to the lower court's rejection of the mental-steps doctrine or to the new technological-arts standard. n18 Rather, the Court clearly held that new mathematical procedures that can be conducted in old computers, like mental processes and abstract intellectual concepts, see *id.*, at 67, are not patentable processes within the meaning of § 101.

n17 In the interval between the two *Benson* decisions, the Court of Customs and Patent Appeals decided several cases in which it addressed the patentability of computer-related inventions. In *In re McIlroy*, 58 C. C. P. A. (Pat.) 1249, 442 F.2d 1397 (1971), and *In re Waldbaum*, 59 C. C. P. A. (Pat.) 940, 457 F.2d 997 (1972), the court relied primarily upon *Musgrave* and *Benson*. In *In re Ghiron*, 58 C. C. P. A. (Pat.) 1207, 442 F.2d 985 (1971), the court reaffirmed *Tarczy-Hornoch's* rejection of the "function of a machine" doctrine.

n18 Although the Court did not discuss the mental-steps doctrine in *Benson*, some commentators have suggested that the Court implicitly relied upon the doctrine in that case. See, e. g., Davis, *supra* n. 2, at 14, and n. 92. Other commentators have observed that the Court's analysis in *Benson* was entirely consistent with the mental-steps doctrine. See, e. g., Comment, Computer Program Classification: A Limitation on Program Patentability as a Process, 53 Or. L. Rev. 501, 517-518, n. 132 (1974).

[*202] The Court of Customs and Patent Appeals had its first opportunity to interpret *Benson* in *In re Christensen*, 478 F.2d 1392 (1973). In *Christensen*, the claimed invention was a method in which the only novel element was a mathematical formula. The court resur-

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

rected the point-of-novelty approach abandoned in *Musgrave* and held that a process claim in which the point of novelty was a mathematical equation to be solved as the final step of the process did not define patentable subject matter after *Benson*. 478 F.2d, at 1394. Accordingly, the court affirmed the Patent Office Board of Appeals' rejection of the claims under § 101.

The Court of Customs and Patent Appeals in subsequent cases began [***175] to narrow its interpretation of *Benson*. In *In re Johnston*, 502 F.2d 765 (1974), the court held that a recordkeeping machine system which comprised a programmed digital computer was patentable subject matter under § 101. *Id.*, at 771. The majority dismissed *Benson* with the observation that *Benson* involved only process, not apparatus, claims. 502 F.2d, at 771. Judge Rich dissented, arguing that to limit *Benson* only to process claims [**1065] would make patentability turn upon the form in which a program invention was claimed. 502 F.2d, at 773-774. n19 The court again construed *Benson* as limited only to process claims in *In re Noll*, 545 F.2d 141 (1976), cert. denied, 434 U.S. 875 (1977); apparatus claims were governed by the court's pre-*Benson* conclusion that a programmed computer was structurally different from the same computer without that particular program. 545 F.2d, at 148. In dissent, Judge Lane, joined by Judge Rich, argued that *Benson* should be read as a general proscription of the patenting of computer programs regardless of the form of the claims. 545 F.2d, at 151-152. Judge Lane's interpretation of *Benson* was rejected by the majority [*203] in *In re Chatfield*, 545 F.2d 152 (1976), cert. denied, 434 U.S. 875 (1977), decided on the same day as *Noll*. In that case, the court construed *Benson* to preclude the patenting of program inventions claimed as processes only where the claims would pre-empt all uses of an algorithm or mathematical formula. 545 F.2d, at 156, 158-159. n20 The dissenting judges argued, as they had in *Noll*, that *Benson* held that programs for general-purpose digital computers are not patentable subject matter. 545 F.2d, at 161.

n19 The decision of the Court of Customs and Patent Appeals was reversed by this Court on other grounds in *Dann v. Johnston*, 425 U.S. 219 (1976).

n20 In addition to interpreting *Benson*, the majority also maintained that *Christensen*, despite its point-of-novelty language, had not signalled a return to that form of claim analysis. 545 F.2d, at 158. The court would reaffirm this proposition consistently thereafter. See, e. g., *In re de Castelet*, 562 F.2d 1236, 1240 (1977); *In re Richman*, 563 F.2d 1026, 1029-1030 (1977); *In*

re Freeman, 573 F.2d 1237, 1243-1244 (1978); *In re Toma*, 575 F.2d 872, 876 (1978); *In re Walter*, 618 F.2d 758, 766-767 (1980).

Following *Noll* and *Chatfield*, the Court of Customs and Patent Appeals consistently interpreted *Benson* to preclude the patenting of a program-related process invention only when the claims, if allowed, would wholly pre-empt the algorithm itself. One of the cases adopting this view was *In re Flook*, 559 F.2d 21 (1977), n21 which was reversed in *Parker v. Flook*, 437 U.S. 584 (1978). Before this Court decided *Flook*, however, the lower court developed a two-step procedure for analyzing program-related inventions in light of *Benson*. In *In re Freeman*, 573 F.2d 1237 (1978), the court held that such inventions must first be examined to determine whether a mathematical algorithm is directly or indirectly claimed; if an algorithm is recited, the court must then determine whether the claim would wholly pre-empt that algorithm. Only if a claim satisfied both inquiries was *Benson* considered applicable. 573 F.2d, at 1245. [***176] See also *In re Toma*, 575 F.2d 872, 877 (CCPA 1978).

n21 See also *In re Deutsch*, 553 F.2d 689, 692-693 (CCPA 1977); *In re Waldbaum*, 559 F.2d 611, 616-617 (CCPA 1977); *In re de Castelet*, *supra*, at 1243-1245.

[*204] In *Flook*, this Court clarified *Benson* in three significant respects. First, *Flook* held that the *Benson* rule of unpatentable subject matter was not limited, as the lower court believed, to claims which wholly pre-empted an algorithm or amounted to a patent on the algorithm itself. 437 U.S., at 589-590. Second, the Court made it clear that an improved method of calculation, even when employed as part of a physical process, is not patentable subject matter under § 101. *Id.*, at 595, n. 18. Finally, the Court explained the correct procedure for analyzing a patent claim employing a mathematical algorithm. Under this procedure, the algorithm is treated for § 101 purposes as though it were a familiar part of the prior art; the claim is then examined to determine whether it discloses "some other inventive concept." *Id.*, at 591-595. n22

n22 This form of claim analysis did not originate with *Flook*. Rather, the Court derived it from the landmark decision of *O'Reilly v. Morse*, 15 How. 62, 115 (1854). In addition, this analysis is functionally the same as the point-of-novelty analysis used in conjunction with the mental-

450 U.S. 175, *, 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

steps doctrine. In fact, the Patent Office in the past occasionally phrased its mental-steps rejections in essentially the terms later employed in *Flook*. See nn. 13-15, *supra*. See generally Comment, 35 U. S. C. 101 Claim Analysis -- The Point of Novelty Approach, 62 J. Pat. Off. Soc. 521 (1980).

[**1066]

Although the Court of Customs and Patent Appeals in several post-*Flook* decisions held that program-related inventions were not patentable subject matter under § 101, see, e. g., *In re Sarkar*, 588 F.2d 1330 (1978); *In re Gelnovatch*, 595 F.2d 32 (1979), in general *Flook* was not enthusiastically received by that court. In *In re Bergy*, 596 F.2d 952 (1979), the majority engaged in an extensive critique of *Flook*, concluding that this Court had erroneously commingled "distinct statutory provisions which are conceptually unrelated." 596 F.2d, at 959. n23 In subsequent cases, the court construed [*205] *Flook* as resting on nothing more than the way in which the patent claims had been drafted, and it expressly declined to use the method of claim analysis spelled out in that decision. The Court of Customs and Patent Appeals has taken the position that, if an application is drafted in a way that discloses an entire process as novel, it defines patentable subject matter even if the only novel element that the inventor claims to have discovered is a new computer program. n24 The court interpreted *Flook* in this manner in its opinion in this case. See *In re Diehr*, 602 F.2d 982, 986-989 (1979). In my judgment, this reading of *Flook* -- although entirely consistent with the lower court's expansive approach to § 101 during the past 12 years -- trivializes the holding in *Flook*, the principle that underlies [***177] *Benson*, and the settled line of authority reviewed in those opinions.

n23 The Court of Customs and Patent Appeals suggested that the cause of this Court's error was the argument presented by the Solicitor General in *Flook*. According to the majority, the Solicitor General's briefs "badly, and with a seeming sense of purpose" confused the statutory requirements. 596 F.2d, at 962. The court went on to describe part of the Solicitor General's argument in *Flook* as "subversive nonsense." 596 F.2d, at 963.

n24 See, e. g., *In re Johnson*, 589 F.2d 1070 (1978); *In re Phillips*, 608 F.2d 879 (1979); *In re Sherwood*, 613 F.2d 809 (1980), cert. pending, No. 79-1941.

As I stated at the outset, the starting point in the proper adjudication of patent litigation is an understanding of what the inventor claims to have discovered. Indeed, the outcome of such litigation is often determined by the judge's understanding of the patent application. This is such a case.

In the first sentence of its opinion, the Court states the question presented as "whether a process for curing synthetic rubber . . . is patentable subject matter." *Ante*, at 177. Of course, that question was effectively answered many years ago when Charles Goodyear obtained his patent on the vulcanization process. n25 The patent application [**1067] filed by Diehr [*206] and Lutton, however, teaches nothing about the chemistry of the synthetic rubber-curing process, nothing about the raw materials to be used in curing synthetic rubber, nothing about the equipment to be used in the process, and nothing about the significance or effect of any process variable such as temperature, curing time, particular compositions of material, or mold configurations. In short, Diehr and Lutton do not claim to have discovered anything new about the process for curing synthetic rubber.

n25 In an opinion written over a century ago, the Court noted:

"A manufacturing process is clearly an art, within the meaning of the law. Goodyear's patent was for a process, namely, the process of vulcanizing india-rubber by subjecting it to a high degree of heat when mixed with sulphur and a mineral salt.

....

"The mixing of certain substances together, or the heating of a substance to a certain temperature, is a process." *Tilghman v. Proctor*, 102 U.S. 707, 722, 728 (1881).

See also *Corning v. Burden*, 15 How. 252, 267 (1854). Modern rubber curing methods apparently still are based in substantial part upon the concept discovered by Goodyear:

"Since the day 120 years ago when Goodyear first heated a mixture of rubber and sulphur on a domestic stove and so discovered vulcanisation, this action of heat and sulphur has remained the standard method of converting crude rubber, with all its limitations, into a commercially usable product, giving it the qualities of resistance to heat and cold in addition to considerable mechanical strength.

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

"Goodyear also conjured up the word 'cure' for vulcanisation, and this has become the recognized term in production circles." Mernagh, *Practical Vulcanisation*, in *The Applied Science of Rubber* 1053 (W. Naunton ed. 1961).

See generally Kimmich, *Making Rubber Products for Engineering Uses*, in *Engineering Uses of Rubber* 18, 28-34 (A. McPherson & A. Klemm eds. 1956)

As the Court reads the claims in the Diehr and Lutton patent application, the inventors' discovery is a method of constantly measuring the actual temperature inside a rubber molding press. n26 As I read the claims, their discovery is an [*207] improved method of calculating the time that the mold should remain closed during the curing process. n27 If [***178] the Court's reading of the claims were correct, I would agree that they disclose patentable subject matter. On the other hand, if the Court accepted my reading, I feel confident that the case would be decided differently.

n26 "Respondents characterize their contribution to the art to reside in the process of constantly measuring the actual temperature inside the mold." See *ante*, at 178.

n27 Claim 1 is quoted in full in n. 5 of the Court's opinion, *ante*, at 179. It describes a "method of operating a rubber-molding press for precision molded compounds with the aid of a digital computer." As the Court of Customs and Patent Appeals noted, the improvement claimed in the application consists of "opening the mold at precisely the correct time rather than at a time which has been determined by approximation or guesswork." *In re Diehr*, 602 F.2d 982, 988 (1979).

There are three reasons why I cannot accept the Court's conclusion that Diehr and Lutton claim to have discovered a new method of constantly measuring the temperature inside a mold. First, there is not a word in the patent application that suggests that there is anything unusual about the temperature-reading devices used in this process -- or indeed that any particular species of temperature-reading device should be used in it. n28 Second, since devices for constantly [*208] measuring actual temperatures -- on a back porch, for example -- have been familiar articles for quite some time, I find it difficult to believe that a patent application filed in 1975 was premised on the notion that a "process of constantly measuring the actual temperature" had just been discov-

ered. Finally, the Patent and Trademark Office Board of Appeals expressly found that "the only difference between the conventional methods of operating a molding press and that claimed in [the] application rests in those steps of the claims which relate to the calculation incident to the solution of the mathematical problem or formula used to control the [**1068] mold heater and the automatic opening of the press." n29 This finding was not disturbed by the Court of Customs and Patent Appeals and is clearly correct.

n28 In the portion of the patent application entitled "Abstract of the Disclosure," the following reference to monitoring the temperature is found:

"An interval timer starts running from the time of mold closure, and the temperature within the mold cavity is measured often, typically every ten seconds. The temperature is fed to a computer . . ." App. to Pet. for Cert. 38a.

In the portion of the application entitled "Background of the Invention," the following statement is found:

"By accurate and constant calculation and recalculation of the correct mold time under the temperatures actually present in the mold, the material can be cured accurately and can be relied upon to produce very few rejections, perhaps completely eliminating all rejections due to faulty mold cure." *Id.*, at 41a.

And, in the "Summary of the Invention," this statement appears:

"A surveillance system is maintained over the mold to determine the actual mold temperature substantially continuously, for example, every ten seconds, and to feed that information to the computer along with the pertinent stored data and along with the elapsed time information." *Ibid.*

Finally, in a description of a simple hypothetical application using the invention described in Claim 1, this is the reference to the temperature-reading device:

"Thermocouples, or other temperature-detecting devices, located directly within the mold cavity may read the temperature at the surface where the molding compound touches the mold, so that it

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

actually gets the temperature of the material at that surface." *Id.*, at 45a.

n29 *Id.*, at 24a.

A fair reading of the entire patent application, as well as the specific claims, makes it perfectly clear that what Diehr and Lutton claim to have discovered is a method of using a digital computer to determine the amount of time that a rubber molding press should remain closed during the synthetic rubber-curing process. There is no suggestion that there is anything novel in the instrumentation of the mold, in actuating a timer when the press is closed, or in automatically opening the press when the computed time [***179] expires. n30 Nor does the [*209] application suggest that Diehr and Lutton have discovered anything about the temperatures in the mold or the amount of curing time that will produce the best cure. What they claim to have discovered, in essence, is a method of updating the original estimated curing time by repetitively recalculating that time pursuant to a well-known mathematical formula in response to variations in temperature within the mold. Their method of updating the curing time calculation is strikingly reminiscent of the method of updating alarm limits that Dale Flook sought to patent.

n30 These elements of the rubber-curing process apparently have been well known for years. The following description of the vulcanization process appears in a text published in 1961:

"Vulcanisation is too important an operation to be left to human control, however experienced and conscientious. Instrumentation makes controlled cure possible, and in consequence instrument engineering is a highly important function in the modern rubber factory, skilled attention being necessary, not only in the maintenance of the instruments but also in their siting. There are instruments available which will indicate, record or control all the services involved in vulcanisation, including time, temperature and pressure, and are capable of setting in motion such operations as the opening and closing of moulds and, in general, will control any process variable which is capable of being converted into an electric charge or pneumatic or hydraulic pressure impulse." Mernagh, *supra* n. 25, at 1091-1092.

Parker v. Flook, 437 U.S. 584 (1978), involved the use of a digital computer in connection with a catalytic conversion process. During the conversion process, variables such as temperature, pressure, and flow rates were constantly monitored and fed into the computer; in this case, temperature in the mold is the variable that is monitored and fed into the computer. In *Flook*, the digital computer repetitively recalculated the "alarm limit" -- a number that might signal the need to terminate or modify the catalytic conversion process; in this case, the digital computer repetitively recalculates the correct curing time -- a number that signals the time when the synthetic rubber molding press should open.

The essence of the claimed discovery in both cases was an algorithm that could be programmed on a digital computer. n31 [*210] In *Flook*, the algorithm made use of multiple process variables; in this case, it makes use of only one. In *Flook*, the algorithm was expressed in a newly developed mathematical formula; in this case, the algorithm makes use of a well-known mathematical formula. Manifestly, neither of these differences can explain today's holding. n32 [**1069] What I [***180] believe [*211] does explain today's holding is a misunderstanding of the applicants' claimed invention and a failure to recognize the critical difference between the "discovery" requirement in § 101 and the "novelty" requirement in § 102. n33

n31 Commentators critical of the *Flook* decision have noted the essential similarity of the two inventions:

"The *Diehr* invention improved the control system by continually remeasuring the temperature and recalculating the proper cure time. The computer would simultaneously keep track of the elapsed time. When the elapsed time equalled the proper cure time, the rubber would be released automatically from the mold.

"The facts are difficult to distinguish from those in *Flook*. Both processes involved (1) an initial calculation, (2) continual remeasurement and recalculation, and (3) some control use of the value obtained from the calculation." Novick & Wallenstein, *supra* n. 5, at 326 (footnotes omitted).

n32 Indeed, the most significant distinction between the invention at issue in *Flook* and that at issue in this case lies not in the characteristics of the inventions themselves, but rather in the drafting of the claims. After noting that "[the] Diehr claims are reminiscent of the claims in *Flook*," Blumenthal & Riter, *supra* n. 15, at 502-

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

503 (footnote omitted), the authors of a recent article on the subject observe that the Court of Customs and Patent Appeals' analysis in this case "lends itself to an interesting exercise in claim drafting." *Id.*, at 505. To illustrate their point, the authors redrafted the Diehr and Lutton claims into the format employed in the *Flook* application:

"An improved method of calculating the cure time of a rubber molding process utilizing a digital computer comprising the steps of:

"a. inputting into said computer input values including

"1. natural logarithm conversion data ([1]n),

"2. an activation energy constant (C) unique to each batch of rubber being molded,

"3. a constant (X) dependent upon the geometry of the particular mold of the press, and

"4. continuous temperature values (Z) of the mold during molding;

"b. operating said computer for

"1. counting the elapsed cure time,

"2. calculating the cure time from the input values using the Arrhenius equation $[1]n V <v1>equ CZ+X$, where V is the total cure time, and

"c. providing output signals from said computer when said calculated cure time is equal to said elapsed cure time." *Ibid.*

The authors correctly conclude that even the lower court probably would have found that this claim was drawn to unpatentable subject matter under § 101. *Id.*, at 505-506.

n33 In addition to confusing the requirements of § § 101 and 102, the Court also misapprehends the record in this case when it suggests that the Diehr and Lutton patent application may later be challenged for failure to satisfy the requirements of § § 102 and 103. See *ante*, at 191. This suggestion disregards the fact that the applicants overcame all objections to issuance of the patent except the objection predicated on § 101. The Court seems to assume that § § 102 and 103 issues of novelty and obviousness remain open on remand. As I understand the record, however, those issues have already been resolved. See

Brief for Respondents 11-14; Reply Memorandum for Petitioner 3-4, and n. 4. Therefore, the Court is now deciding that the patent will issue.

III

The Court misapplies *Parker v. Flook* because, like the Court of Customs and Patent Appeals, it fails to understand or completely disregards the distinction between the subject matter of what the inventor *claims* to have discovered -- the § 101 issue -- and the question whether that claimed discovery is in fact novel -- the § 102 issue. n34 If there is not even a [*212] claim that anything constituting patentable subject matter has been discovered, there is no occasion to address the novelty issue. n35 Or, as [***181] was true in *Flook*, if the only concept that the inventor claims to have discovered is not patentable subject matter, § 101 requires that the application be rejected without reaching any issue under § 102; for it is irrelevant that unpatentable subject matter -- in that case a formula for updating alarm limits -- may in fact be novel.

n34 The early cases that the Court of Customs and Patent Appeals refused to follow in *Prater*, *Musgrave*, and *Benson* had recognized the distinction between the § 101 requirement that what the applicant claims to have invented must be patentable subject matter and the § 102 requirement that the invention must actually be novel. See, e. g., *In re Shao Wen Yuan*, 38 C. C. P. A. (Pat.), at 973-976, 188 F.2d, at 382-383; *In re Abrams*, 38 C. C. P. A. (Pat.), at 951-952, 188 F.2d, at 169; *In re Heritage*, 32 C. C. P. A. (Pat.), at 1173-1174, 1176-1177, 150 F.2d, at 556, 558; *Halliburton Oil Well Cementing Co. v. Walker*, 146 F.2d, at 821, 823. The lower court's error in this case, and its unenthusiastic reception of *Gottschalk v. Benson* and *Parker v. Flook*, is, of course, consistent with its expansive reading of § 101 in *Tarczy-Hornoch*, *Prater*, and their progeny.

n35 The Court's opinion in *Flook* itself pointed out this distinction:

"The obligation to determine what type of discovery is sought to be patented must precede the determination of whether that discovery is, in fact, new or obvious." 437 U.S., at 593.

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

As the Court of Customs and Patent Appeals noted in this case, "for the claim to be statutory, there must be some substance to it other than the recitation and solution of the equation or formula." 602 F.2d, at 988. See Comment, 62 J. Pat. Off. Soc., *supra* n. 22, at 522-523.

Proper analysis, therefore, must start with an understanding of what the inventor claims to have discovered - or phrased [**1070] somewhat differently -- what he considers his inventive concept to be. n36 It seems clear to me that Diehr and [**213] Lutton claim to have developed a new method of programming a digital computer in order to calculate -- promptly and repeatedly -- the correct curing time in a familiar process. n37 In the § 101 analysis, we must assume that the sequence of steps in this programming method is novel, unobvious, and useful. The threshold question of whether such a method is patentable subject matter remains.

n36 The Court fails to focus upon what Diehr and Lutton claim to have discovered apparently because it believes that this method of analysis would improperly import novelty considerations into § 101. See *ante*, at 188-191, 193, n. 15. Rather than directing its attention to the applicants' claimed discovery, the Court instead focuses upon the general industrial context in which the applicants intend their discovery to be used. Implicit in this interpretation of the patent application is the assumption that, as long as the claims describe a specific implication of the applicants' discovery, patentable subject matter is defined. This assumption was expressly rejected in *Flook*:

"This assumption is based on respondent's narrow reading of *Benson*, and is as untenable in the context of § 101 as it is in the context of that case. It would make the determination of patentable subject matter depend simply on the draftsman's art and would ill serve the principles underlying the prohibition against patents for 'ideas' or phenomena of nature. The rule that the discovery of a law of nature cannot be patented rests, not on the notion that natural phenomena are not processes, but rather on the more fundamental understanding that they are not the kind of 'discoveries' that the statute was enacted to protect." 437 U.S., at 593 (footnote omitted).

n37 A few excerpts from the original patent application will emphasize this point:

"The invention will probably best be understood by first describing a simple example, in which a single mold is involved and in which the information is relatively static.

....

"A standard digital computer may be employed in this method. It has a data storage bank of suitable size which, of course, may vary when many molds are used and when more refinements are employed. However, Fig. 1 shows a relatively simple case which achieves results that are vast improvements over what has been done up to now. . . .

"The data bank of the computer is provided with a digital input into which the time-temperature cure data for the compound involved is fed, as shown in Fig. 1. All the data is available to the computer upon call, by random access, and the call can be automatic depending upon the temperature actually involved. In other words, the computer over and over questions the data storage, asking, what is the proper time of cure for the following summation of temperatures? The question may be asked each second, and the answer is readily provided.

....

"Recalculation continues until the time that has elapsed since mold closure corresponds with the calculated time. Then, the computer actuates the mold-opening device and the mold is automatically opened." App. to Pet. for Cert. 43a-45a.

The Figure 1 referred to in the application is as follows:

[SEE ILLUSTRATION IN ORIGINAL]

Id., at 53a.

If that method is regarded as an "algorithm" as that term was used in *Gottschalk v. Benson*, 409 U.S. 63 (1972), [***182] and in [**214] *Parker v. Flook*, 437 U.S. 584 (1978), n38 and if no other inventive concept is disclosed in the patent application, the question must be answered in the negative. In [**1071] both *Benson* and *Flook*, the parties apparently agreed that the inventor's discovery was properly regarded as an algorithm; the holding that an algorithm was a "law of nature" that could not be [**215] patented therefore determined that

those discoveries were not patentable processes within the meaning of § 101.

n38 In *Benson*, we explained the term "algorithm" in the following paragraph:

"The patent sought is on a method of programming a general-purpose digital computer to convert signals from binary-coded decimal form into pure binary form. A procedure for solving a given type of mathematical problem is known as an 'algorithm.' The procedures set forth in the present claims are of that kind; that is to say, they are a generalized formulation for programs to solve mathematical problems of converting one form of numerical representation to another. From the generic formulation, programs may be developed as specific applications." 409 U.S., at 65.

As the Court recognizes today, *Flook* also rejected the argument that patent protection was available if the inventor did not claim a monopoly on every conceivable use of the algorithm but instead limited his claims by describing a specific postsolution activity -- in that case setting off an alarm in a catalytic conversion process. In its effort to distinguish *Flook* from the instant case, the Court characterizes that postsolution activity as "insignificant," *ante*, at 191, or as merely "token" activity, *ante*, at 192, n. 14. As a practical matter, however, the postsolution activity described in the *Flook* application was no less significant than the automatic opening of the curing mold involved in this case. For setting off an alarm limit at the appropriate time is [***183] surely as important to the safe and efficient operation of a catalytic conversion process as is actuating the mold-opening device in a synthetic rubber-curing process. In both cases, the post-solution activity is a significant part of the industrial process. But in neither case should that activity have any *legal* significance because it does not constitute a part of the inventive concept that the applicants claimed to have discovered. n39

n39 In *Flook*, the Court's analysis of the postsolution activity recited in the patent application turned, not on the relative significance of that activity in the catalytic conversion process, but rather on the fact that that activity was not a part of the applicant's discovery:

"The notion that post-solution activity, no matter how conventional or obvious in itself, can transform an unpatentable principle into a patentable process exalts form over substance. A

competent draftsman could attach some form of post-solution activity to almost any mathematical formula; the Pythagorean theorem would not have been patentable, or partially patentable, because a patent application contained a final step indicating that the formula, when solved, could be usefully applied to existing surveying techniques. The concept of patentable subject matter under § 101 is not 'like a nose of wax which may be turned and twisted in any direction . . . ' *White v. Dunbar*, 119 U.S. 47, 51." 437 U.S., at 590 (footnote omitted).

In *Gottschalk v. Benson*, we held that a program for the [*216] solution by a digital computer of a mathematical problem was not a patentable process within the meaning of § 101. In *Parker v. Flook*, we further held that such a computer program could not be transformed into a patentable process by the addition of postsolution activity that was not claimed to be novel. That holding plainly requires the rejection of Claims 1 and 2 of the Diehr and Lutton application quoted in the Court's opinion. *Ante*, at 179-180, n. 5. In my opinion, it equally requires rejection of Claim 11 because the presolution activity described in that claim is admittedly a familiar part of the prior art. n40

n40 Although the Court of Customs and Patent Appeals erred because it ignored the distinction between the § 101 requirement that the applicant must claim to have discovered a novel process and the § 102 requirement that the discovery must actually be novel, that court correctly rejected the argument that any difference between Claim 11 and the earlier claims was relevant to the § 101 inquiry. See 602 F.2d, at 984, 987-988.

Even the Court does not suggest that the computer program developed by Diehr and Lutton is a patentable discovery. Accordingly, if we treat the program as though it were a familiar part of the prior art -- as well-established precedent requires n41 -- it is absolutely clear that their application contains no claim of patentable invention. Their application was therefore properly rejected under § 101 by the Patent Office and the Board of Appeals.

n41 This well-established precedent was reviewed in *Parker v. Flook*:

"*Mackay Radio* and *Funk Bros.* point to the proper analysis for this case: The process itself,

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

not merely the mathematical algorithm, must be new and useful. Indeed, the novelty of the mathematical algorithm is not a determining factor at all. Whether the algorithm was in fact known or unknown at the time of the claimed invention, as one of the 'basic tools of scientific and technological work,' see *Gottschalk v. Benson*, 409 U.S., at 67, it is treated as though it were a familiar part of the prior art." 437 U.S., at 591-592.

IV

[**1072] The broad question whether computer programs should be given patent [***184] protection involves policy considerations that [*217] this Court is not authorized to address. See *Gottschalk v. Benson*, 409 U.S., at 72-73; *Parker v. Flook*, 437 U.S., at 595-596. As the numerous briefs *amicus curiae* filed in *Gottschalk v. Benson*, *supra*, *Dann v. Johnston*, 425 U.S. 219 (1976), *Parker v. Flook*, *supra*, and this case demonstrate, that question is not only difficult and important, but apparently also one that may be affected by institutional bias. In each of those cases, the spokesmen for the organized patent bar have uniformly favored patentability and industry representatives have taken positions properly motivated by their economic self-interest. Notwithstanding fervent argument that patent protection is essential for the growth of the software industry, n42 commentators have noted that "this industry is growing by leaps and bounds without it." n43 In addition, even [*218] some commentators who believe that legal protection for computer programs is desirable have expressed doubts that the present patent system can provide the needed protection. n44

n42 For example, the Association of Data Processing Service Organizations, appearing as *amicus curiae* in *Flook*, made the following policy argument:

"The need of the incentive of patents for software is at least as great as that of the incentive available for hardware, because: 'Today, providing computer software involves greater . . . risk than providing computer . . . hardware. . . .'

"To a financial giant, the economic value of a patent may not loom large; to the small software products companies upon which the future of the development of quality software depends, the value of the patent in financing a small company may spell the difference between life and death. To banks and financial institutions the existence of a patent or even the potentiality of ob-

taining one may well be a decisive factor in determining whether a loan should be granted. To prospective investors a patent or the possibility of obtaining one may be the principal element in the decision whether to invest.

"Making clear that patents may be available for inventions in software would unleash important innovative talent. It would have the direct opposite effect forecast by the . . . hardware manufacturers; it would enable competition with those companies and provide the needed incentive to stimulate innovation." Brief for ADAPSO as *Amicus Curiae* in *Parker v. Flook*, O. T. 1977, No. 77-642, p. 44 (footnote omitted).

n43 Gemignani, *supra* n. 1, at 309. In a footnote to that comment, Professor Gemignani added that the rate of growth of the software industry "has been even faster lately than that of the hardware industry which does enjoy patent protections." *Id.*, at 309, n. 259. Other commentators are in accord. See Nycum, Legal Protection for Computer Programs, 1 *Computer L. J.* 1, 55-58 (1978); Note, Protection of Computer Programs: Resurrection of the Standard, 50 *Notre Dame Law.* 333, 344 (1974).

n44 See, e. g., Gemignani, *supra* n. 1, at 301-312; Keefe & Mahn, Protecting Software: Is It Worth All the Trouble?, 62 *A. B. A. J.* 906, 907 (1976).

Within the Federal Government, patterns of decision have also emerged. Gottschalk, Dann, Parker, and Diamond were not ordinary litigants -- each was serving as Commissioner of Patents and Trademarks when he opposed the availability of patent protection for a program-related invention. No doubt each may have been motivated by a concern about the ability of the Patent Office to process effectively the flood of applications that would inevitably flow from a decision that computer programs are patentable. n45 The consistent [***185] concern evidenced by the Commissioner of Patents and Trademarks and by the Board of Appeals of the Patent and Trademark Office has not been shared by the Court of Customs and Patent Appeals, which reversed the Board in *Benson*, *Johnston*, and *Flook*, and was in [**1073] turn reversed by this Court in each of those cases. n46

n45 This concern influenced the President's Commission on the Patent System when it rec-

450 U.S. 175, *; 101 S. Ct. 1048, **;
67 L. Ed. 2d 155, ***; 1981 U.S. LEXIS 73

ommended against patent protection for computer programs. In its report, the President's Commission stated:

"The Patent Office now cannot examine applications for programs because of the lack of a classification technique and the requisite search files. Even if these were available, reliable searches would not be feasible or economic because of the tremendous volume of prior art being generated. Without this search, the patenting of programs would be tantamount to mere registration and the presumption of validity would be all but nonexistent." Report of the President's Commission, *supra* n. 10, at 13.

n46 It is noteworthy that the position of the Court of Customs and Patent Appeals in the process patent area had been consistent with that of the Commissioner of Patents and Trademarks for decades prior to 1968. As discussed in Part I, *supra*, in that year the court rejected two long-standing doctrines that would have foreclosed patentability for most computer programs under § 101.

[*219] Scholars have been critical of the work of both tribunals. Some of that criticism may stem from a conviction about the merits of the broad underlying policy question; such criticism may be put to one side. Other criticism, however, identifies two concerns to which federal judges have a duty to respond. First, the cases considering the patentability of program-related inventions do not establish rules that enable a conscientious patent lawyer to determine with a fair degree of accuracy which, if any, program-related inventions will be patentable. Second, the inclusion of the ambiguous concept of an "algorithm" within the "law of nature" category of unpatentable subject matter has given rise to the concern that almost any process might be so described and therefore held unpatentable.

In my judgment, today's decision will aggravate the first concern and will not adequately allay the second. I believe both concerns would be better addressed by (1) an unequivocal holding that no program-related invention is a patentable process under § 101 unless it makes a contribution to the art that is not dependent entirely on the utilization of a computer, and (2) an unequivocal explanation that the term "algorithm" as used in this case, as in *Benson* and *Flook*, is synonymous with the term "computer program." n47 Because [*220] the invention claimed in the patent application at issue in this case makes no contribution to the art that is not entirely de-

pendent upon the utilization of a computer in a familiar process, I would reverse the decision of the Court of Customs and Patent Appeals.

n47 A number of authorities have drawn the conclusion that the terms are in fact synonymous. See, e. g., Novick & Wallenstein, *supra* n. 5, at 333, n. 172; Anderson, Algorithm, 1 Encyclopedia of Computer Science & Technology 364, 369 (J. Belzer, A. Holzman & A. Kent eds. 1975); E. Horowitz & S. Sahni, Fundamentals of Computer Algorithms 2 (1978); A. Tanenbaum, Structured Computer Organization 10 (1976). Cf. Blumenthal & Riter, *supra* n. 15, at 455-456; Gemignani, *supra* n. 1, at 271-273, 276, n. 37.

REFERENCES: Return To Full Text Opinion

Go to Supreme Court Briefs

Go to Oral Argument Transcript

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Annotation References:

Supreme Court's views as to what is patentable subject matter under federal law or "process," "machine," "manufacture," or "composition of matter." 65 L Ed 2d 1197.

Patentability of computer programs. 6 ALR Fed 156.

IN RE ALBERT W. MUSGRAVE

No. 8292

United States Court of Customs and Patent Appeals

57 C.C.P.A. 1352; 431 F.2d 882; 1970 CCPA LEXIS 291; 167 U.S.P.Q. (BNA) 280

Oral argument March 4, 1970

October 8, 1970

PRIOR HISTORY: [***1]

Appeal From Patent Office, Serial No. 496,735

DISPOSITION:

Reversed.

COUNSEL:

Virgil E. Woodcock (Woodcock, Phelan & Washburn), attorney of record, for appellant. *James H. Littlepage, Sidney A. Johnston, William J. Scherback, Richard E. Kurtz*, of counsel.

S. Wm. Cochran for the Commissioner of Patents. *Jere W. Sears*, of counsel.

OPINIONBY:

RICH

OPINION: [**882]

[*1353] Before RICH, ALMOND, BALDWIN, LANE, Associate Judges, and ROSENSTEIN, Judge, sitting by designation

RICH, Judge, delivered the opinion of the court.

This appeal is from the decision of the Patent Office Board of Appeals n1 affirming the rejection of claims 1-14, 17-39, 47-58 and 60 of application serial No. 496,735, filed September 30, 1965, and entitled "Corrections for Seismic Data Obtained from Expanding-Spread." Six apparatus claims have been allowed. We reverse.

n1 Consisting of Kreek, Keely, and Andrews, Examiners-in-Chief, opinion by Andrews.

The Invention

The principal object of appellant's invention is to obtain seismograms which delineate with a high degree of precision the nature of the subsurface formations in the earth's crust.

Background

Appellant's brief states: [***2]

A seismogram is a record of earth vibrations. In a reflection seismic survey, dynamite is detonated at a shotpoint, as in a shallow borehole, for the generation [*1354] of seismic energy. A part of the downwardly traveling energy is reflected upwardly at each subsurface interface. A reflecting interface is a region where there is a change in the velocity [of the seismic energy] as between adjoining layers of the earth, such as a layer of rock (high velocity) and a layer of sand (low velocity). In addition to change in velocity of the seismic energy in the earth due to the velocity characteristics [**883] of layers, the velocity through the earth increases with depth.

At the earth's surface, the upwardly reflected energy is detected by a plurality of seismic detectors or geophones. These extend linearly along a line of exploration. After each explosion of dynamite [along the line of exploration], each detector over a period of several seconds generates a plurality of electrical signals representative, inter alia, of reflected energy, multiples, and noise due to random earth movements unrelated to the effect of the reflected seismic energy. [Bracketed insertions [***3] ours.]

A seismogram is produced by recording, on a magnetic tape for example, the electrical signals generated by each detector. Ordinarily, a "family" of seismograms is

produced for each dynamite blast - there being one seismogram for each detector. A plurality of dynamite blasts along a line of exploration will therefore yield a plurality of families of seismograms.

Appellant refers to two ways in which the detectors may be arranged with respect to the shotpoints along the line of exploration, one being referred to as a "split-spread" and the other as an "expanded-spread." In a split-spread, the shotpoint is located in the center of a spread of detectors. In an expanded-spread the shotpoint is located on the line of exploration but at some distance from the spread of detectors. It is unnecessary for an understanding of this opinion to be aware of further details of these arrangements. It will suffice to note that appellant uses both arrangements simultaneously to produce two families of seismograms for each dynamite blast.

To render meaningful the seismogram produced as described above, it is necessary to apply to it a so-called "weathered-layer correction" and a so-called [***4] "normal move-out correction." With respect to the former, appellant explains that at the earth's surface there is an unconsolidated, solidated, weathered layer (commonly called "soil") of variable depth and inclination. The velocity of seismic energy passing through this layer is much lower than in the consolidated layer just beneath it. Since the weathered layer is of variable thickness and of low velocity, it is necessary to subtract the travel time of the seismic energy in the weathered layer from the total travel time.

Because of the high velocity contrast which exists between the base of the weathered layer and the adjoining consolidated layer, some [*1355] of the seismic energy produced at the shotpoint will travel downward to the interface of the weathered and consolidated layers and be reflected upward to the detectors. The time-occurrence of the first reflection on the seismogram (time-zero being the instant the dynamite is detonated) provides the time-correction needed to eliminate the effect of the weathered layer on the time or depth measurements of interest.

A normal move-out correction is necessary to compensate for the geometrical spreading of the detectors. [***5] Since the measurements of interest are depths below the earth's surface, the identification of reflections in terms of vertical travel time is desired. Obviously, the travel path, and therefore travel time, from a shotpoint to a given reflecting interface or "horizon" and then to a given detector is greater for a detector located some distance from the shotpoint than for a detector directly adjacent the shotpoint. In correcting a family of seismograms for normal move-out, however, it must also be taken into account that the effect of geometrical spreading of the

detectors decreases with increases in depth from which a given seismic wave is reflected. Therefore, normal move-out corrections must be "dynamic"; that is, the magnitude of each correction for each detector must be varied inversely with the depth from which a wave is reflected - the greater the depth the less the correction. Stated differently, the longer the time-occurrence of a given wave is from timezero [**884] on a seismogram, the less it is corrected for normal move-out.

Correction of a family of seismograms for the weathered-layer and normal move-out yields, in effect, a new family of seismograms on which [***6] the positions of the representations of seismic waves relative to one another more nearly correspond to the relative depths of the horizons from which those waves were reflected. Perfect corrections would cause all the reflection signals corresponding to a given horizon to be lined up across the set of seismograms. However, since the corrections are ordinarily somewhat imperfect, further adjustments are made by reproducing the seismograms as traces on an oscilloscope and manipulating knobs on the oscilloscope to bring the reflections into horizontal alignment.

Refinement of this "new" seismogram is accomplished by identification and elimination of "multiples." Multiples represent unwanted signals which must be eliminated to avoid errors in measurements of the time-occurrence of reflections. These unwanted signals occur by [*1356] reason of multiple reflection of seismic waves, for example, as shown in Fig. 5A:

[Graphic omitted. See illustration in original.]

Reflections R(1), R(2), R(3) arise because of seismic waves reflected to the earth's surface from Horizons RH(1), RH(2), and RH(3), respectively. Multiple M(1) arises because a wave is reflected from the earth's [***7] surface to horizon RH(1) and thence again to the surface. Its travel time is twice that for reflection R(1). M(11) and M(12) illustrate other types of multiple reflections. There are still others which may obscure the time-appearance of the reflections which are the features of principal interest.

Appellant describes still other techniques used to refine seismograms, such as removal of noise signals due to random earth movements, but these are not critical to appellant's invention.

Appellant's Discovery

Appellant has discovered that a family of seismograms obtained by using an expanded -spread of detectors can be most precisely corrected for the effect of the weathered layer by deriving the necessary time-correction from the time-occurrence of the first reflection

on a corresponding family of seismograms obtained using a split -spread of detectors.

Appellant has also discovered that the reflection-wave front of energy detected by an expanded-spread of detectors is hyperbolic in character. Based on this discovery, appellant has developed a new technique for identifying the multiples which involves applying functions of hyperbolic character to a family of seismograms. [***8] In this way, the magnitudes of errors in the normal move-out corrections can be determined and multiples can be separated from reflections, making it possible to remove the multiples from the seismograms.

Appellant's application emphasizes that to use his techniques, the seismograms must be "phonographically reproducible, whether on [*1357] magnetic, photographic or other reproducible medium." Apparently, this is necessary because the refinement of seismograms as described above involves repeated recording and playing back of the signals representative of seismic waves.

The Appealed Method Claims

We consider claims 2 and 60 to be representative. For ease of reference and understanding we reproduce these [**885] claims in numbered paragraph format, contributed in part by us:

2. In seismic exploration, the method of establishing weathering corrections in the form of individual static time-corrections for the signals from each of a plurality of seismic detecting stations spaced one from the other along a traverse which comprises

[1] generating at generating stations seismic signals adjacent selected ones of said detecting stations whereby the magnitude of said [***9] static corrections at said selected stations are known,

[2] applying said known static corrections respectively to signals generated at said selected stations,

[3] applying relative to said known corrections interpolated static corrections to the remaining signals generated at the remaining of said detecting stations, and thereafter

[4] generating at generating stations further seismic signals at spaced locations along said line,

[5] detecting at the location of a first group of said stations and thereafter at other locations of other groups of said stations seismic signals, said locations being selected in reference to the locations of said second-named generating stations for the production of an expanding-spread seismic section having applied to the signals from each of said detecting stations said static corrections, and

[6] applying dynamic normal moveout corrections to the signals of each group of said detectors to correct them for geometrical spreading.

60. In seismic exploration where a family of seismograms are produced, each seismogram including multiple reflection signals and a plurality of single reflection signals representative of waves reflected [***10] from subsurface reflecting points after travel to said points over a plurality of paths, each of which for any one of said seismograms differs from the path for any other of said seismograms, the method which comprises:

[1] generating signals from each of said seismograms,

[2] applying to said generated signals a succession of dynamic time-adjustments, one for each said seismogram, and of magnitude to correct for normal movement delays present in said seismograms.

[3] time-shifting said generated signals, the magnitude of the time-shifts varying across said family of seismograms in accordance with a plurality of approximately hyperbolic functions of different eccentricities, and

[4] adding together said generated signals for the production of summation signals representing (a) multiple, reflections which add together cumulatively for certain of said hyperbolic functions, and (b) single reflections which add together cumulatively for other of said hyperbolic functions.

[*1358] The Rejection

The sole rejection is based on 35 USC 101. We will refer only to the board's opinion since all points raised in the examiner's Answer are discussed therein and will refer [***11] only to the board's general remarks applicable to all the claims and specific remarks directed to claims 2 and 60. The board stated:

The Examiner rejects each of the claims on appeal on the doctrine in *In re Abrams*, 38 CCPA 945 * * * 188 F.2d 165, 89 USPQ 266. This, of course is a rejection based on 35 U.S.C. 101 and is a finding that the subject matter sought to be patented is not embraced by the patent statutes. The Examiner acknowledges that certain of the claims [including claim 2] on appeal * * * set forth physical steps that are clearly old in the Salvatori et al. and Jolly patents n2 [**886] * * * but asserts that patentability of the method is not dependent on these physical steps but on the other non-physical or "mental" steps set forth in these claims. * * * the Examiner asserts that [the other claims including claim 60] * * * include no physical steps but set forth merely a method of processing data which does not require any tangible device or

apparatus to carry out the method and hence could be carried out mentally.

n2 United States patents to Salvatori et al., 2,087,120, July 13, 1937, and Jolly, 3,105,568, Oct. 1, 1963.

Appellant * * * strongly urged [***12] that the Abrams case is not applicable law where there is a disclosure in the specification, as here, that the process can be carried out with apparatus there specified even though the method also could be carried out within the human mind without the apparatus. Appellant further contends that the Abrams Rule 1 and Rule 2 * * * are not applicable to any claim on appeal.

* * * we are not impressed by either logic or the authorities cited by appellant that a claim which embraces within its scope and is patentable only because it embraces non-statutory subject matter should be allowed on the basis of a disclosure not referred to in the claim, of a possible physical alternative to the non-physical or "mental" steps embraced by the claim. This would seem to be no more logical than it would be to allow a broad apparatus claim that read on the prior art devices solely on the basis of a particular new apparatus disclosed although not claimed specifically. In each instance it would be a case of over-claiming by an applicant to embrace by the claims that which cannot be patented under the statutes. 35 U.S.C. 100(b) provides a sanction for the claiming, as a method, the use of a known machine, [***13] and obviously would be extended to include a new use of a new machine, but the use of the machine there contemplated must be claimed and not merely disclosed in the specification.

Nor do we find any logic or authority for departing from the Rule 2 of Abrams so that claims which include both statutory physical steps and non-statutory non-physical or "mental" steps can be patentable on the sole basis of the non-statutory subject matter included therein. Were this Rule not the case, then methods of telling fortunes or predicting the activities of the stock market would be patentable providing one included the use of playing cards or a desk calculator in a claim that otherwise is for a non-statutory algorithm, such as the hypothesized principles underlying human behavior or the fluctuating values of the stock market.

[*1359] In our view the merits of the Examiner's rejection must turn on the applicability of either Rule 1 or Rule 2 of the Abrams case to each of the appealed claims and not on any suggested liberalization of those rules to cause the statute to embrace non-physical or "mental" activities even though they be valuable and meritorious discoveries.

* * *

We shall [***14] first consider claim 2 which, in our opinion, appears to be more illustrative of the interpretive problem than any other of the principal claims which appellant has designated as decisive of the issues on this appeal. * * *

* * *

The preamble of claim 2 refers to "signals * * * from seismic detecting stations" so that "signals" here could have only the meaning of the output of a device which senses waves transmitted through the earth. Since these signals are not specified to be electrical, mechanical or optical or to denote any other physical state or a material or thing, the sole connotation here would be that "signals" (i.e. without a modifier) are synonymous with information or data and are an abstraction and intangible.

In step (1) of claim 2 the expression "generating * * * seismic signals" could possibly have reference to the fact [**887] that in step (3) the detecting stations also "generate signals" and the "seismic" modifier to the term "signals" could indicate merely the seismic origin of the information content of the signals. However, to be consistent with step (5) in which "seismic" signals could only have the meaning such as earth waves, we shall construe [***15] this term in the instant claims to mean the generation of a physical state in a physical body, the earth, when the expression "seismic signals" is used and to mean the generation of abstract data when the term "signals" is used, that is unmodified as to any physical thing that is altered to give rise to the signals.

We find no basis for interpreting "signals" to be limited to electrical or magnetic signals as might be present in an electrical conductor or a magnetic recording media consonant with the special analog computer illustrated in appellant's drawings, for appellant expressly directs otherwise in * * * his specification, which reads as follows: "With the foregoing outline of the operations as a whole, it will be understood that the several method steps may be carried out by a wide variety of apparatus, including computing equipment, which by a mathematical approach will provide solutions to equations which may be exact or approximate, as may be desired. In the more detailed description which follows, there will be presented both the field techniques and a description of simplified analog type of instruments by means of which the invention may be utilized and which are illustrative [***16] of the many features of the invention, to which the appended claims have been directed."

The carrying out of appellant's method by a "mathematical approach", through "solutions to equations" and with "computing equipment" (which we presume would be digital in character in order to contrast

with the analog computer specifically illustrated) is inconsistent with the "signals", where claimed without modifier, being the result of a change in state of a physical or material thing.

The "whereby" clause of step (1) of claim 2 is a statement of a wanted result that conceals the fact that mere generation and/or detection of "seismic signals" by themselves do not make known the static, corrections specified by the claim. Omitted therefrom and essential thereto is the step of exercising human judgment that would be required to interpret these signals to gain any knowledge of the static corrections needed.

[*1360] However, to the extent that step (1) calls for a physical and hence a statutory process, it is fully anticipated by the Salvatori et al. and Jolly patents in which seismic signals are generated also to derive corrections to be used in seismic explorations.

Steps (2) [***17] and (3) of claim 2 apply the corrections derived from the human judgment implicit in step (1) to "signals" which are generated at various "selected" or "detecting" stations. Since "corrections" are data having no physical means for representing the same, application of corrections to signals generated at the detecting stations, as called for by these steps, necessarily is a step requiring only the compilation of data from two sources. In step (3) the corrections are required to be further "interpolated" which likewise is an act requiring human judgment.

Steps (2) and (3) are non-statutory since they require no physical act on any physical thing.

Step (4) of claim 2 sets forth a second step of physically generating "seismic signals" which finds its counterpart in the successive generation of seismic waves of the cited patents.

Step (5) of claim 2 detects "seismic signals" which might at first appear to be physical acts involving waves transmitted through the earth but the "signals" from each detecting station must be information or data only, since "corrections" are applied to them. Both Salvatori et al. and Jolly have detecting apparatus [**888] that carry out whatever [***18] physical acts are contemplated by step (5).

Step (6) of claim 2 applies further "corrections" to the data evolved from the detectors, and necessarily requires no physical act on any physical thing.

From the above analysis it appears that insofar as claim 2 sets forth a statutory process, it is merely the physical steps of generating a succession of seismic waves and detecting such waves following each step of generation. That which is presented to distinguish these claims over the conventional method of seismic exploration

is the broad method of applying correction data to experimental data by every possible procedure, including mere mental processing of the data.

We sustain the rejection of claim 2 as for non-statutory subject matter.

* * *

Claim 60 represents a method of processing data which starts with existing seismograms and generates signals therefrom which are processed as data through successive transformations none of which specify or require the use of apparatus or the employment of any physical acts on physical things. This claim merely calls for a general mathematical or a general graphical solution of an algorithm which appellant has propounded but which [***19] cannot be patented directly as an algorithm, or indirectly, as a series of conceptual steps in a method of solving the algorithm, under the statutes as they have been interpreted heretofore.

The rejection of claim 60 is sustained.

The opening sentence of the argument in the Patent Office brief states that,

The opinion by the Board * * * represents the best comprehensive statement of the Patent Office position.

OPINION

All claims here are method claims. All claims stand rejected on the sole ground that they are non-statutory, i.e., none defines a "process" within the meaning of 35 USC 101, read with the definition of 35 USC [*1361] 100(b) in mind. The asserted reason for holding the claims non-statutory is that either all steps of the claims are "mental steps" or some of the steps are "mental" and are relied on for patentability.

The examiner said his rejection was "based on the three categories of claims developed in" *In re Abrams*, 38 CCPA 945, 188 F.2d 165, 89 USPQ 266 (1951), and was sound because the claims fall within either the first or second categories of Abrams. In affirming, the board accepted the examiner's reasoning and referred to the "Rules" set [***20] forth in Abrams, those rules being the "categories" referred to by the examiner. The board opinion, it should be noted, was rendered several months prior to even our first opinion in *In re Prater*, 56 CCPA 1360, 415 F.2d 1378, 159 USPQ 583 (Nov. 20, 1968, Judge Smith's opinion), on rehearing 56 CCPA 1381, 415 F.2d 1393, 162 USPQ 541 (Aug. 14, 1969, Judge Baldwin's opinion).

Since the three so-called "Rules of Abrams" appear to have been the legal basis of both decisions below, as well as the basis for the Patent Office Solicitor's brief before us, we deem it appropriate to state at the outset

our position as to those so-called rules, a matter which was considered in penetrating detail in our initial Prater opinion, delivered by the late Judge Smith, and in no way contradicted in our later superseding opinion, delivered by Judge Baldwin.

In *Abrams*, appellant's counsel proposed, by way of argument which he hoped would win him a reversal, "three suggested 'rules of law.'" n3 In *Abrams* [**889] the court pointed out that the proposed rules had evidently been submitted to the Patent Office and that neither the examiner nor the board had either approved or disapproved them. The [***21] court declined to adopt them. Judge Smith said in *Prater* - and time and restudy do not enable us to improve on his statement - that

n3 *Abrams*' counsel's proposed Rules were:

1. If all the steps of a method claim are purely mental in character, the subject matter thereof is not patentable within the meaning of the patent statutes.

2. If a method claim embodies both positive and physical steps as well as so-called mental steps, yet the alleged novelty or advance over the art resides in one or more of the so-called mental steps, then the claim is considered unpatentable for the same reason that it would be if all the steps were purely mental in character.

3. If a method claim embodies both positive and physical steps as well as so-called mental steps, yet the novelty or advance over the art resides in one or more of the positive and physical steps and the so-called mental step or steps are incidental parts of the process which are essential to define, qualify or limit its scope, then the claim is patentable and not subject to the objection contained in 1 and 2 above.

* * * much confusion in subsequent interpretation of the *Abrams* decision has been caused by people [***22] misreading the decision as conferring judicial sanction upon the "rules" formulated and proposed by *Abrams*' attorney. This confusion has arisen because the court after initially declaring there was no necessity to embrace the rules, apparently adopted Rule 2 towards the later part of the opinion. We believe this later statement was advanced not to show adoption of the rules by the court but merely to point out that even if, *arguendo*, the court had adopted his rules, *Abrams* would still not have prevailed in his particular fact situation.

[*1362] After further discussion of the case of *Don Lee, Inc. v. Walker*, 61 F.2d 58, 14 USPQ 272 (9th Cir. 1932), cited in *Abrams* and apparently the genesis of the

"mental step" concept in patent law, Judge Smith concluded, and we agree:

As a partial summary of our reasoning so far, we have observed that the "Rules" of *Abrams* * * * were not given the status of judicial acceptance by the court in *Abrams* and remain no more than parts of the argument put forward by *Abrams*' counsel. Further, we note that even if "Rule 2" had been so adopted, the rule when traced to its origin in *Don Lee* rests on an uncertain basis as precedent.

* * * [***23]

We do not feel our reasoning need be encumbered by the so-called "Rules" of *Abrams* for the reasons we have indicated.

On rehearing, our new opinion by Judge Baldwin notes the fact that *Abrams* had been exhaustively analyzed in Judge Smith's opinion and expresses no disagreement with that analysis. It remains our view that we need not be encumbered in our reasoning by the "Rules" of *Abrams* for the reason that they have never enjoyed the approval of this court.

[1] Additionally, it is our view that "Rules" 2 and 3, at least, are logically unsound. According to these "Rules," a process containing both "physical steps" and so-called "mental steps" constitutes statutory subject matter if the "alleged novelty or advance in the art resides in" steps deemed to be "physical" and non-statutory if it resides in steps deemed to be "mental." It should be apparent, however, that novelty and advancement of an art are irrelevant to a determination of whether the nature of a process is such that it is encompassed by the meaning of "process" in 35 USC 101. Were that not so, as it would not be if "Rules" 2 and 3 were the law, a given process including both "physical" and "mental" steps could [***24] be statutory during the infancy of the field of technology to which it pertained, when the physical steps were new, and non-statutory at some later time after the physical steps became old, acquiring prior art status, which would be an absurd result. Logically, the identical process cannot be first within and later without the categories of statutory subject matter, depending on such extraneous factors.

Whether "Rule" 1 of *Abrams* would lead to a correct result on the ultimate question of patentability would depend on how one interprets "purely mental." n4 [**890] If so construed as to encompass only steps incapable [*1363] of being performed by a machine or apparatus, it might lead to a correct result. Clearly there are no steps of that nature in the presently appealed claims. If the expression "purely mental" is construed (as the board apparently did here) so as to encompass

steps performable by apparatus, as well as mentally, then the "Rule" is unsound for reasons expressed below.

n4 In this regard, see footnotes 22 and 23 of Judge Baldwin's Prater opinion. In "The Field of the Statutory Useful Arts," by Coulter, 34 *J.Pat.Off.Soc'y.* 417 (1952), the author points out at p. 426 what "peculiarly human activities" involve, in the second paragraph of the following extract:

There is an important point that should not be overlooked. In all of the technological "mental step" cases, the claims say nothing about mental steps or a human operator. The situation is that one or more steps are of such nature that they can be performed by a human operator, who is required to use his brain, and that no device for automatically performing such steps is specifically described in the specification. The claims are held not to define a statutory "useful art" even though, if the method were performed without a human operator (which is not excluded from the claims), it would constitute a statutory "useful art." In the Abrams case, for instance, there was no intimation that the specified petroleum prospecting method would not be a "useful art" if the criticized steps were performed by devices.

And to a person familiar with the available devices, it is clear that in principle all of the steps could be performed by devices. None of the steps involve peculiarly human mental activities which cannot, in principle, be performed by devices. None of them involve aesthetic, emotional, imaginative, or creative thought or reactions on the part of the practitioners (operators). None of them involve human "value judgments" - that is, judgments on human conduct, ethics, morals, economics, politics, law, aesthetics, etc.

[***25]

The sole rejection in this case being based on the ground that the subject matter of the appealed claims is "non-statutory," we here set down the involved statute, 35 USC 101 (emphasis ours):

101. Inventions patentable

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Since no question is raised as to novelty or utility, the only question is whether the claimed subject matter

falls within one of the enumerated categories of patentable inventions and the only category here involved is "process." A definition of process is provided in 35 USC 100(b) reading:

(b) The term "process" means, process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.

The Patent Office has raised no question involving application of the definition. It simply insists that the methods of the appealed claims are not such as are encompassed by the term "process" because the claims all fall into one of two categories: (1) "all mental steps"; (2) "some [***26] mental steps and some physical steps with patentability dependent on the mental steps." The examiner himself categorized his rejection as a "mental step rejection" and this raises two questions: Are some or all of the steps in each claim "mental" and, if so, is that fatal to patentability?

[2] As may be seen from the statutory language, it contains nothing whatever which would either include or exclude claims containing "mental steps" and whatever law there may be on the subject cannot be attributed to Congress. It is purely a question of case law. [*1364] That law we, like others, have found to be something of a morass. As indicated by footnote 22 in Judge Baldwin's Prater opinion, "mental" is a vague term of indefinite meaning, and whether a given step is "mental," or "purely mental," is [**891] a question which has had to be determined on a case-by-case basis, "considering all of the surrounding circumstances." Since, additionally, the legal significance of a finding that a given step was or was not "mental" or "purely mental" was itself in doubt, characterizing steps of method claims as "mental," "purely mental," "physical," or "purely physical" gave little certainty [***27] to the law. Nothing points this up as well as consideration of some of the opinions by the Patent Office Board of Appeals in cases in which the board has reversed "mental step" rejections.

Ex parte Moser et al., 124 USPQ 454 (Board of Appeals 1959), involved claims to a process of operating a fluidized-bed coking unit, which process contained steps of determining a maximum permissible feed rate in accordance with a relationship between viscosity and another factor on a continuous basis and varying the severity of the coking operation in accordance therewith. The examiner rejected the claims as unpatentable in that they recited "mental steps." In reversing, the board said:

While determination of the relationship between viscosity and Conradson carbon of the feed may be in the nature of a mental process, we are not satisfied that the step of "continuously measuring the viscosity of the feed passing into the coking zone" is itself a wholly mental step requiring condemnation of the claims. Where, as

here, operating conditions of a process are varied directly in accordance with the changes in a certain physical characteristic of the feed stock, it appears proper and necessary to [***28] recite the continuous measurement of this property. * * * We agree with the appellants that the essential novelty in the case is in the positive and physical step of controlling the severity of the coking operation in response to variations in viscosity of the feed oil and not in the determination of the relationship between the viscosity and Conradson carbon or in the measurement of the viscosity, which are incidental steps in the process although desirably included in the claims in order to properly define, qualify or limit their scope. We will, accordingly, not sustain the rejection of the appealed claims as drawn to unpatentable subject matter because of the recitation of mental steps.

Ex parte McNabb, 127 USPQ 456 (Board of Appeals 1959), was concerned with claims to a method of locating defects in wooden objects such as telephone poles by radiographic methods involving several steps. A reference was cited showing radiographic testing of objects such as welded pipe to locate defects. The examiner rejected the claims on the reference because, he said, it showed the first three steps of the claim to be old and the other steps could not be relied on because they were "purely [***29] mental." In disagreeing with the examiner, the board said (emphasis ours):

[*1365] We have carefully considered the examiner's position but are not in agreement therewith. The step of reading the film with a densitometer is obviously not a mental step since a densitometer is a piece of apparatus which functions to measure the density of the film by its inherent mode of operation. Plotting the optical densities as a function of the film likewise is no more of a mental step than reading a thermometer or gauge and plotting the value therefrom. Ascertaining the deviations from the norm of the curve can obviously be done by means of a French curve and a pair of dividers. The deviations, if any, from the norm are clearly evident from the graph plotted from the densitometer data. Orienting the deviations with respect to the test object is merely aligning the graph in its proper position, as indicated by the graph itself. None of these steps are purely mental or interpretative mental steps. Any method or step in a method which can be manually performed and requires the use of the human eyes for detection or determination of any [**892] condition, such as temperature, pressure, [***30] time, etc., and/or the use of the hands for the purpose of manipulating, such as turning off or on or regulating a given device in a certain manner or at a certain time, etc., to produce a certain result necessarily involves the human mind and hence can be classed as a mental step. Such steps, however, are not purely mental or interpretative mental steps and are not the kind which

are prohibited by the decisions relating to purely mental steps.

Ex parte Kahn, 124 USPQ 511 (Board of Appeals 1959), related to a method of insect control. Evidently insects were to be selectively attracted according to species by a sound recording, to their ultimate disadvantage. The claim recited a number of steps including recording a sound signal produced by "one live female member of the selected insect species" while she was feeding during the periods around sunrise and sunset, modifying the signal by amplifying the high-frequency component to obtain an output signal, recording that signal, and then

reproducing the sound from said recording in the presence of captive live members of the insect species to be controlled, marking portions of the recording representing sounds most attractive to [***31] the captive insects based upon the behavior of the insects.

and re-recording the marked portions repetitively. The examiner cited no prior art and rejected the claim because, he said, the invention could not be practiced "without the exercise of mental steps."

The board prefaced its opinion by saying,

We know of no decision that holds that a method is per se unpatentable merely because its practice requires that the operator thereof must think:

The board stated it to be the examiner's view that in selecting the portions of the recording to be repetitively reproduced the selection had to be made on the basis of an evaluation, "in the light of the knowledge and judgment of the individual or individuals making the recording." This he felt was "mental" and fatal to the claim. The board disagreed, saying (our emphasis):

The claim recites, however, that the first recorded sounds are reproduced in the presence of live insects and the portions of this first recording are selected or [*1366] marked on the basis of the observed effect on captive insects. In other words, captive insects indicate the parts of the record attractive to them (do the selecting), the operator observes [***32] such fact and appropriately marks the record. While it may be true that it would be advisable for the operator to think while observing whether or not the portion of the record being played attracts the captive insects, the actual steps out in the claim are independent of such thought and thus do not come under the types of decisions herein considered. Thus, the challenged portion of the claim is clearly a proper limitation and should be evaluated in connection with pertinent prior art as to its patentable effect or lack thereof upon the ground that it is a proper limitation.

For further opinions containing similar reasoning by the board see *Ex parte Egan*, 129 USPQ 23 (1960), a

case which, incidentally, accepted the Abrams "Rules" as established law; *Ex parte Garrett*, 132 USPQ 514 (1961); *Ex parte Bond*, 135 USPQ 160 (1961), which reaffirms the Kahn statement that a method is not unpatentable merely because its practice requires the operator to think; and *Ex parte Tripp*, 141 USPQ 918 (1963).

Turning now to the board decision in the present appeal, we have said above that the board used the Abrams non-rules as the primary basis of its decision that the claims are non-statutory. [***33] This was legal error for the reasons already stated.

[3] The above-quoted extracts from the board opinion further reveal that the board repeatedly asserted that steps were "mental" and rendered the claims [**893] non-statutory because they were not physical acts applied to physical things. This presumes that the law requires all steps of a statutory "process" to be physical acts applied to physical things. We considered this matter in *Prater*. In the first opinion by Judge Smith we showed how this erroneous idea arose from a dictum in *Cochrane v. Deener*, 94 U.S. 780 (1876), and is inconsistent with several later Supreme Court opinions. In Judge Baldwin's *Prater* opinion we readopted a large portion of Judge Smith's opinion on this point and again pointed out that it was a misconstruction to assume that "all processes, to be patentable, must operate physically upon substances." As above noted, the board's opinion herein was rendered before the dates of our *Prater* opinions. The board's contrary presumption as to the statutory requirements further infects its conclusions with legal error.

[4] Another aspect of the board's reasoning which we consider legally unsound in [***34] holding claims non-statutory resides in its giving weight to the fact that certain individual steps in the claims lacked novelty, as shown by cited art. In considering the patentability of a process consisting of a plurality of steps we think it is immaterial to the question whether the combination is a statutory "process" that individual steps are old. The whole process could be old and yet be statutory; a fortiori, it matters not that one or more steps are old.

[*1367] The board also considered individual steps in the claims to be "non-statutory," as in its conclusion about steps (2) and (3) of claim 2. While it may be a minor matter or a mere lapsus linguae, we are here concerned only with whether the combinations of steps constituting the claimed processes are statutory "processes."

Although representatives claims 2 and 60, quoted above, are directed to different aspects of appellant's invention, each of the claimed processes basically involves manipulations of certain "signals" to obtain a more meaningful record of seismic events. The "signals" may take the form of impressions on a magnetic tape,

electrical impulses in an analog or digital computer, or visible patterns [***35] on graph paper or on an oscilloscope screen. The actual manipulation of the signals may be effected by apparatus or manually, depending on the form taken by the "signals," the proper degree of manipulation being definable mathematically.

[5] We cannot agree with the board that these claims (all the steps of which can be carried out by the disclosed apparatus) are directed to non-statutory processes merely because some or all the steps therein can also be carried out in or with the aid of the human mind or because it may be necessary for one performing the processes to think. All that is necessary, in our view, to make a sequence of operational steps a statutory "process" within 35 USC 101 is that it be in the technological arts so as to be in consonance with the Constitutional purpose to promote the progress of "useful arts." Const. Art. 1, sec. 8.

Of course, to obtain a valid patent the claim must also comply with all the other provisions of the statute, including definiteness under 35 USC 112. A step requiring the exercise of subjective judgment without restriction might be objectionable as rendering a claim indefinite, but this would provide no statutory basis for a rejection [***36] under 35 USC 101. Moreover, as pointed out previously, the claims here on appeal clearly contain no steps of that type.

In view of the errors of reasoning of the board in reaching the legal conclusion that the claims are all non-statutory, and finding no other reasons warranting that conclusion, its decision affirming the rejection of all the appealed claims must be reversed.

CONCURBY:

BALDWIN

CONCUR:

BALDWIN, Judge, concurring.

I feel compelled to speak out against the majority opinion. It is my position that the doctrine promulgated by that opinion, which constitutes a major and [**894] radical shift in this area of the law, is a serious breach with the time-honored judicial practice of resolving important questions of law on a case-by-case basis, a policy matter which I thought had been settled by agreement of the full court with the second *Prater* decision and which up to now the court has followed. In addition, [*1368] I feel that the course which the majority opinion takes is not only unnecessary in order to decide this particular case (or any others in this area, for that matter), but also will probably create more problems than it is intended to solve. Finally, I [***37] must point out that the major-

ity embarked on this course without having been asked to do so by appellant.

What the Majority Opinion Does

One need only read the last page of the opinion to find the principal holding: "All that is necessary * * * to make a sequence of operational steps a statutory 'process' within 35 USC 101 is that it be in the technological arts." No limitations are placed upon this holding. In effect it is a pronouncement of new law.

At first reading, it may appear that this holding is but a resurrection of that made in Judge Smith's opinion in the first Prater decision. Closer analysis reveals that the majority now goes much beyond the holding of our late colleague. A major basis of the holding in that first Prater opinion was that the claimed process must be "disclosed as being a sequence or combination of steps, capable of performance without human intervention." [Emphasis added.] The opinion was clearly dealing with claims drawn primarily to cover a machine-implemented process but which were found to read also on carrying out the process using mental steps.

Here, however, the majority does not so limit its holding. Musgrave obviously discloses [***38] a process which can be implemented entirely by machine. Indeed, he argues with respect to some of his claims that it is unreasonable to interpret them as covering anything but a machine-implemented process. Nevertheless, the majority now says, in effect, that one no longer need disclose apparatus for carrying out his process.

Thus, while not only being a drastic departure from the policy decision implicit in the second Prater case, i.e., to decide the problems in this area of mental processes on a case-by-case basis, the majority opinion also goes far beyond the holding in the first Prater decision. As such, it should be recognized as overruling those cases which were so carefully distinguished by Judge Smith in Prater I.

Is This Change Really Necessary?

Academically, intellectually, perhaps, the majority's new proposal - to throw out entirely the "mental steps" doctrine and replace it with a new rule - may sound appealing. Any process which is drawn to a technological art is now held to come within the ambit of the Patent Laws. I submit, however, that this court should concern itself only with realities and let the law professors worry about academic problems. [*1369] [***39] The realities here are that "mental steps" are no longer a serious problem.

The actual ruling in Prater II was that the process claims there involved covered more than the appellant conceded they were intended to cover and that those

claims were therefore unpatentable under 35 USC 112. In dictum, however, the court resolved the biggest problem then facing the patent community, i.e., whether process claims drawn to cover the operation of a programmed digital computer would be subject to the protection of the patent statutes. With regard to the mental steps problem, the court further made it clear that the only proper inquiry should be as follows: Assuming the disclosure of a novel, unobvious machine-implemented process, [**895] would a reasonable n1 interpretation of the claims include coverage of the process implemented by the human mind?

n1 As applied in Prater II and Mahony (infra, note 3), the standard of reasonableness would be the meaning of the claims to one of ordinary skill in the pertinent art when read in light of and consistently with the specification.

More recent cases before this court have made it clear that there is now only a very narrow scope to this [***40] "fearful" mental steps doctrine. In *In re Bernhart* n2 and *In re Mahony*, n3 we found that the process claims there involved, when interpreted reasonably, did not include within their coverage mental implementation. Additionally, Rule 2 of what the majority calls the "Abrams non-rules" was given a fatal blow in *Bernhart* where we held that a claimed invention is not non-statutory merely because "the novelty is indicated by an expression which does not itself fit in a statutory class." Further, in *Mahony*, the Patent Office view that a claim reading on both statutory and non-statutory subject matter could not comply with the second paragraph of section 112 was discarded.

n2 57 CCPA 737, 417 F.2d 1395, 163 USPQ 611 (1969).

n3 57 CCPA 939, 421 F.2d 742, 164 USPQ 572 (1970).

What is left? I submit that in reality very little remains of the "mental steps" doctrine. Before now, the court has not found it necessary to decide whether a claim, drawn to cover a disclosed machine-implemented process but broad enough, even when interpreted reasonably, to cover the same process implemented only with the aid of the human mind, would be statutory. It was also undecided as to what effect [***41] the inclusion of a purely mental step, as defined in footnote 22 of *Prater II*, might have on an otherwise statutory claim. n4 Nor did the court decide whether claims drawn to a process consisting entirely of a sequence of purely mental steps would fit within the ambit of 35 USC 101. The majority now proposes to answer all these questions in the

57 C.C.P.A. 1352, *; 431 F.2d 882, **;
1970 CCPA LEXIS 291, ***; 167 U.S.P.Q. (BNA) 280

affirmative, regardless of the fact that this case could be decided on very narrow grounds.

n4 But see *In re Jones*, 54 CCPA 1218, 373 F.2d 1007, 153 USPQ 77 (1967).

[*1370] I agree with appellant that claim 60, when reasonably interpreted, covers only a machine-implemented process. The decision with regard to that claim and those related to it could have been resolved on that narrow ground. With regard to claim 2 and those other claims which recite a number of "mental" steps along with physical steps, if the court found that they are predicated for patentability on the mental steps (as I believe they are), the board's decision could be reversed by simply following the Bernhart dictum mentioned earlier and approving those enlightened board decisions referred to in the majority opinion which hold, in effect, that if a mental step [***42] is not purely mental, the process including it is within the statutory category of "process" set out in 35 USC 101. This holding would flow naturally from what has been said and held in our earlier opinions, and would be all that is necessary to support reversal of the decision below.

Foreseeable Problems

It seems that whenever a court decides to go beyond what is necessary to decide the case before it, more problems are generated than are solved. I foresee quite a few with the majority's new holding.

First and foremost will be the problem of interpreting the meaning of "technological arts". Is this term intended to be synonymous with the "industrial technology" mentioned by Judge Smith? It sounds broader to me. Necessarily, this will have to be considered a question of law and decided on a case-by-case basis. Prom-

ulgation of any all-encompassing definition has to be impossible. This task is now before us.

Already alluded to is the apparent decision not to require that a machine-implemented process be disclosed. This might have some salutary effect in certain circumstances, where machine implementation [**896] would be obvious from disclosure of the process steps [***43] alone. But what happens where it is not so obvious? Then we could get involved in deciding, first, whether a reasonable interpretation of the claims would include both machine and mental implementation of the process and, second, whether the absence of a disclosure of apparatus for carrying out the process would warrant rejection of the broad process claims for lack of support.

Justifying the decision finding claims drawn entirely to purely mental processes to be statutory, the majority states that "[a] step requiring the exercise of subjective judgment without restriction might be objectionable as rendering a claim indefinite." It should not require much imagination to see the many problems sure to be involved in trying to decide whether a step requiring certain human judgment evaluations is definite or not.

[*1371] As one more example, suppose a claim happens to contain a sequence of operational steps which can reasonably be read to cover a process performable both within and without the technological arts? This is not too far fetched. Would such a claim be statutory? Would it comply with section 112? We will have to face these problems some day.

In conclusion, [***44] I think it is apparent that what the majority has done will only substitute for one set of problems another possibly more complex set. Because the problems will be new, they will add confusion to the law. We are only now beginning to make some sense out of this area of the law. To change at this time, I submit, is non-sense.

MUSCO CORPORATION; MUSCO SPORTS LIGHTING, INC., Plaintiffs/Cross-Appellants, v. QUALITE, INC. d/b/a QUALITE SPORTS LIGHTING, INC., Defendants-Appellants.

96-1212, 96-1217

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

1997 U.S. App. LEXIS 790; 41 U.S.P.Q.2D (BNA) 1954

January 17, 1997, Decided

NOTICE: [*1] RULES OF THE FEDERAL CIRCUIT COURT OF APPEALS MAY LIMIT CITATION TO UNPUBLISHED OPINIONS. PLEASE REFER TO THE RULES OF THE UNITED STATES COURT OF APPEALS FOR THIS CIRCUIT.

SUBSEQUENT HISTORY: Rehearing Denied and In Banc Suggestion Declined February 26, 1997, Reported at: *1997 U.S. App. LEXIS 4809*. Reported in Table Case Format at: *106 F.3d 427, 1997 U.S. App. LEXIS 28410*. Certiorari Denied October 6, 1997, Reported at: *1997 U.S. LEXIS 4669*.

PRIOR HISTORY: United States District Court for the Western District of Michigan. Case No. 1-94-CV-592.

DISPOSITION: Reversed the judgment and vacated the permanent injunction.

JUDGES: Before MAYER, SCHALL, and, BRYSON, Circuit Judges.

OPINION: PER CURIAM.

Qualite, Inc. appeals the judgment of the United States District Court for the Western District of Michigan, Case No. 1-94-CV-592, holding that Qualite infringes method claims in three patents owned by Musco Corporation and Musco Sports Lighting, Inc. (Musco). Because the asserted claims are invalid for lack of enablement, *35 U.S.C. § 112* (1994), we reverse the judgment and vacate the permanent injunction.

A patent's specification must set forth "a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same". *35 U.S.C. § 112*.

Section 112 requires only an objective enablement; [*2] the invention needs to be sufficiently disclosed through illustrative examples or terminology to teach those of ordinary skill in the art how to make and how to use the invention as broadly as it is claimed. *In re Marzocchi*, 58 C.C.P.A. 1069, 439 F.2d 220, 223, 169 U.S.P.Q. (BNA) 367, 369 (CCPA 1971). Although some experimentation on the part of the artisan is not fatal, *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 941, 15 U.S.P.Q.2D (BNA) 1321, 1329 (Fed. Cir. 1990) (the patent document need not be a production specification), either the experimentation must be routine, or the specification must give "a reasonable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a desired embodiment of the invention claimed." *PPG Indus., Inc. v. Guardian Indus. Corp.*, 75 F.3d 1558, 1564, 37 U.S.P.Q.2D (BNA) 1618, 1623 (Fed. Cir. 1996). Enablement is a question of law, which we review de novo, although there may be underlying factual issues, *Moleculon Research Corp. v. CBS, Inc.*, 793 F.2d 1261, 1268, 229 U.S.P.Q. (BNA) 805, 810 (Fed. Cir. 1986); *Quaker City Gear Works, Inc. v. Skil Corp.*, 747 F.2d 1446, 1453-54, 223 U.S.P.Q. (BNA) 1161, 1166 (Fed. [*3] Cir. 1984), to which deference would be due.

Musco alleges that Qualite infringes claim 14 of U.S. Patent No. 4,725,934 (the '934 patent), claims 1-3 of U.S. Patent No. 4,947,303 (the '303 patent), and claims 1, 3-5, 11 and 13 of U.S. Patent No. 5,075,828 (the '828 patent). n1 We use claim 14 of the '934 patent because most of the trial record has been developed around this claim and because in all relevant respects it is representative of the other claims in issue. Claim 14 reads:

A method for producing wide scale, composite lighting of desired and sufficient intensity, quality, and uniformity in and throughout a target space while selectively controlling, diminishing, or eliminating glare, spill light, and any dome or halo effect outside of the target space, said lighting being produced by one or more lamps mounted in reflector, comprising luminaire assembly units, comprising the steps of:

determining the light producing characteristics of each luminaire assembly unit;

determining the sufficient intensity and uniformity of light desired for the target space;

determining the glare, spill light, and dome or halo effect problems, if any, for conventional wide [*4] scale lighting of the target space;

producing wide scale composite lighting while at the same time controlling, diminishing, or eliminating selected wide scale lighting problems by selectively utilizing one or more light controlling steps comprising:

shielding a portion of the lamp;

positioning a reflector extension member on the reflector; and altering the reflecting properties of the interior reflecting surface of the reflector.

n1 The '303 and '828 patents were issued on continuation-in-part applications related to the '934 patent and disclose the use of additional apparatus in the selective utilization process. The asserted claims in all three patents are method claims.

Musco avers that its claimed invention comprises neither the apparatus used in the method nor the determining steps cited in the claims, when used alone or in combinations. Instead, it asserts that the essence of its claimed invention is the method of "selectively utilizing" one or more of the various apparatus to solve [*5] the problems identified by the determining steps. Qualite responds that Musco's claims include impermissible

mental process steps, such as determining the lighting problems and selectively utilizing the accessories. Musco replies that Qualite's enablement challenge is merely a demand "that every detail of anything related to the invention or specification be disclosed in minutiae."

Musco is correct that disclosure of every detail is unnecessary, but a patent specification must disclose enough that the claimed invention can be practiced by one skilled in the art. Assuming, *arguendo*, that the essence of the invention is the "selective utilizing" method referenced in the asserted claims, Musco must disclose the patented basis on which the skilled artisan can make the selection. To satisfy this requirement, it argues that the selection is made as the result of a mental step, which can be found in previously existing knowledge and technology.

If we attempt to preserve the validity of Musco's invention, as a matter of logic we must adopt this proffered "essence" of the invention. The apparatus described in the specifications, whether used individually, severally, or collectively, are [*6] not new to the art of lighting sports arenas or to similar arts, such as automobile head lamps. Similarly, as the parties have stated, the means for determining the lighting requirements for a particular sports field were developed prior to the invention claimed in Musco's patents. Thus, to be distinguishable over the prior art, the narrowest "essence" of the invention that can preserve its validity is one that locates the invention in the method of selectively utilizing the apparatus.

Unfortunately for Musco, the patent specifications do not enable one skilled in the art to practice this "invention." We can find no answer to Qualite's rhetorical question: "on what basis do I make the selection?" If the selection could be made on the basis of mental steps taught by previously existing knowledge and technology such as photometry and computer programs, as Musco suggests, the lack of enabling language in the specifications would be less troubling in part because the required experimentation would be routine. However, if the selection is made based on a well-known mental step, then there is nothing of the essence of this invention left to save it from being obvious.

The existence of [*7] mental steps in the claims or specifications of a patent do not, in and of themselves, invalidate the patent. But where, as here, the claimed subject matter - the selective utilization process - is composed solely of mental steps, at the very least, some aspect of these mental steps must be nonobvious, and the specification must describe this same aspect so as to enable the skilled artisan to practice the invention. Musco argues that a description of the mental step is unnecessary because it is well known in the art and can be prac-

ticed with only routine experimentation. If this is correct, all subject matter claimed by these patents would be obvious, as suggested by the following cross-examination of Myron Gordin, a named inventor.

Q. On what basis? What's the specific scientific basis, if any, for determining how you compose your system from your three accessories?

A. There's not a scientific basis that I'm aware of.

Q. How do you go about -- how does one go about the selection process if the invention is selection of the components and the patent is teaching, what is there in the patent that tells us how to make the selection?

A. A person experienced in [*8] lighting . . . would be able to make a reasonable estimation, you know.

If Musco is incorrect and there is something more to the invention than a well-known mental step, the specification provides no guidance for the skilled artisan to follow in order to practice the invention.

**AT&T CORP., Plaintiff-Appellant, v. EXCEL COMMUNICATIONS, INC.,
EXCEL COMMUNICATIONS MARKETING, INC., and EXCEL
TELECOMMUNICATIONS, INC., Defendants-Appellees.**

98-1338

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

172 F.3d 1352; 1999 U.S. App. LEXIS 7221; 50 U.S.P.Q.2D (BNA) 1447

April 14, 1999, Decided

PRIOR HISTORY: **[**1]** Appealed from: U.S. District Court for the District of Delaware. Judge Sue L. Robinson.

DISPOSITION: REVERSED & REMANDED.

COUNSEL: Constantine L. Trela, Jr., Sidley & Austin, of Chicago, Illinois, argued for plaintiff-appellant. With him on the brief was Joseph S. Miller. Of counsel on the brief were Albert E. Fey, Thomas L. Secrest, and Steven C. Cherney, Fish & Neave, of New York, New York; and Laura A. Kaster and Christopher P. Godziela, AT&T Corp., of Liberty Corner, New Jersey.

Donald R. Dunner, Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P., of Washington, DC, argued for defendants-appellees. With him on the brief were J. Michael Jakes and Howard A. Kwon. Of counsel on the brief were Mike McKool, Jr., Eric W. Buether, and Monte M. Bond, McKool Smith, P.C., of Dallas, Texas.

JUDGES: Before PLAGER, CLEVENGER, and RADER, Circuit Judges.

OPINIONBY: PLAGER

OPINION: **[*1353]** PLAGER, Circuit Judge.

This case asks us once again to examine the scope of section 1 of the Patent Act, 35 U.S.C. § 101 (1994). The United States District Court for the District of Delaware granted summary judgment to Excel Communications, Inc., Excel Communications Marketing, Inc., and Excel Telecommunications, Inc. (collectively **[**2]** "Excel"), holding U.S. Patent No. 5,333,184 (the '184 patent) invalid under § 101 for failure to claim statutory subject matter. See *AT&T Corp. v. Excel Communications, Inc.*, 1998 U.S. Dist. LEXIS 5346, No. CIV.A.96-434-SLR,

1998 WL 175878, at *7 (D. Del. Mar. 27, 1998). AT&T Corp. ("AT&T"), owner of the '184 patent, appeals. Because we find that the claimed subject matter is properly within the statutory scope of § 101, we reverse the district court's judgment of invalidity on this ground and remand the case for further proceedings.

BACKGROUND

A.

The '184 patent, entitled "Call Message Recording for Telephone Systems," issued on July 26, 1994. It describes a message record for long-distance telephone calls that is enhanced by adding a primary interexchange carrier ("PIC") indicator. The addition of the indicator aids long-distance carriers in providing differential billing treatment for subscribers, depending upon whether a subscriber calls someone with the same or a different long-distance carrier.

The invention claimed in the '184 patent is designed to operate in a telecommunications system with multiple long-distance service providers. The system contains local exchange carriers ("LECs") and long-distance **[**3]** service (interexchange) carriers ("IXCs"). The LECs provide local telephone service and access to IXCs. Each customer has an LEC for local service and selects an IXC, such as AT&T or Excel, to be its primary long-distance service (interexchange) carrier or PIC. IXCs may own their own facilities, as does AT&T. Others, like Excel, called "resellers" or "resale carriers," contract with facility-owners to route their subscribers' calls through the facility-owners' switches and transmission lines. Some IXCs, including MCI and U.S. Sprint, have a mix of their own lines and leased lines.

[*1354] The system thus involves a three-step process when a caller makes a direct-dialed (1+) long-distance telephone call: (1) after the call is transmitted over the LEC's network to a switch, and the LEC identi-

fies the caller's PIC, the LEC automatically routes the call to the facilities used by the caller's PIC; (2) the PIC's facilities carry the call to the LEC serving the call recipient; and (3) the call recipient's LEC delivers the call over its local network to the recipient's telephone.

When a caller makes a direct-dialed long-distance telephone call, a switch (which may be a switch in the interexchange [**4] network) monitors and records data related to the call, generating an "automatic message account" ("AMA") message record. This contemporaneous message record contains fields of information such as the originating and terminating telephone numbers, and the length of time of the call. These message records are then transmitted from the switch to a message accumulation system for processing and billing.

Because the message records are stored in electronic format, they can be transmitted from one computer system to another and reformatted to ease processing of the information. Thus the carrier's AMA message subsequently is translated into the industry-standard "exchange message interface," forwarded to a rating system, and ultimately forwarded to a billing system in which the data resides until processed to generate, typically, "hard copy" bills which are mailed to subscribers.

B.

The invention of the '184 patent calls for the addition of a data field into a standard message record to indicate whether a call involves a particular PIC (the "PIC indicator"). This PIC indicator can exist in several forms, such as a code which identifies the call recipient's PIC, a flag which shows that [**5] the recipient's PIC is or is not a particular IXC, or a flag that identifies the recipient's and the caller's PICs as the same IXC. The PIC indicator therefore enables IXCs to provide differential billing for calls on the basis of the identified PIC.

The application that issued as the '184 patent was filed in 1992. The U.S. Patent and Trademark Office ("PTO") initially rejected, for reasons unrelated to § 101, all forty-one of the originally filed claims. Following amendment, the claims were issued in 1994 in their present form. The '184 patent contains six independent claims, five method claims and one apparatus claim, and additional dependent claims. The PTO granted the '184 patent without questioning whether the claims were directed to statutory subject matter under § 101.

AT&T in 1996 asserted ten of the method claims against Excel in this infringement suit. The independent claims at issue (claims 1, 12, 18, and 40) include the step of "generating a message record for an interexchange call between an originating subscriber and a terminating subscriber," and the step of adding a PIC indicator to the message record. Independent claim 1, for example, adds

a PIC indicator whose [**6] value depends upon the call recipient's PIC:

A method for use in a telecommunications system in which interexchange calls initiated by each subscriber are automatically routed over the facilities of a particular one of a plurality of interexchange carriers associated with that subscriber, said method comprising the steps of:

generating a message record for an interexchange call between an originating subscriber and a terminating subscriber, and

including, in said message record, a primary interexchange carrier (PIC) indicator having a value which is a function of whether or not the interexchange carrier associated with said terminating subscriber is a predetermined one of said interexchange carriers.

(Emphasis added.) Independent claims 12 and 40 add a PIC indicator that shows if a [*1355] recipient's PIC is the same as the IXC over which that particular call is being made. Independent claim 18 adds a PIC indicator designed to show if the caller and the recipient subscribe to the same IXC. The dependent claims at issue add the steps of accessing an IXC's subscriber database (claims 4, 13, and 19) and billing individual calls as a function of the value [**7] of the PIC indicator (claims 6, 15, and 21).

The district court concluded that the method claims of the '184 patent implicitly recite a mathematical algorithm. See *AT&T, 1998 WL 175878*, at *6. The court was of the view that the only physical step in the claims involves data-gathering for the algorithm. See *id.* Though the court recognized that the claims require the use of switches and computers, it nevertheless concluded that use of such facilities to perform a non-substantive change in the data's format could not serve to convert non-patentable subject matter into patentable subject matter. See *id.* at *6-7. Thus the trial court, on summary judgment, held all of the method claims at issue invalid for failure to qualify as statutory subject matter. See *id.* at *7.

DISCUSSION

A.

Summary judgment is appropriate if there are no genuine issues of material fact and the moving party is

entitled to judgment as a matter of law. See *Fed. R. Civ. P. 56(c)*. We review without deference a trial court's grant of summary judgment, with all justifiable factual inferences drawn in favor of the party opposing the motion. See *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, [*8] 255, 91 L. Ed. 2d 202, 106 S. Ct. 2505 (1986).

The issue on appeal, whether the asserted claims of the '184 patent are invalid for failure to claim statutory subject matter under 35 U.S.C. § 101, is a question of law which we review without deference. See *Arrhythmia Research Tech. v. Corazonix Corp.*, 958 F.2d 1053, 1055-56, 22 U.S.P.Q.2D (BNA) 1033, 1035 (Fed. Cir. 1992). In matters of statutory interpretation, it is this court's responsibility independently to determine what the law is. See *Hodges v. Secretary of the Dep't of Health & Human Servs.*, 9 F.3d 958, 960 (Fed. Cir. 1993).

B.

Our analysis of whether a claim is directed to statutory subject matter begins with the language of 35 U.S.C. § 101, which reads:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The Supreme Court has construed § 101 broadly, noting that Congress intended statutory subject matter to "include anything under the sun that is made by man." See *Diamond v. Chakrabarty*, 447 U.S. 303, 309, 65 L. Ed. 2d [*9] 144, 100 S. Ct. 2204 (1980) (quoting S. Rep. No. 82-1979, at 5 (1952); H.R. Rep. No. 82-1923, at 6 (1952)); see also *Diamond v. Diehr*, 450 U.S. 175, 182, 67 L. Ed. 2d 155, 101 S. Ct. 1048 (1981). Despite this seemingly limitless expanse, the Court has specifically identified three categories of unpatentable subject matter: "laws of nature, natural phenomena, and abstract ideas." See *Diehr*, 450 U.S. at 185.

In this case, the method claims at issue fall within the "process" n1 category of the four enumerated categories of patentable subject matter in § 101. The district court held that the claims at issue, though otherwise within the terms of § 101, implicitly recite a mathematical algorithm, see *AT&T*, 1998 WL 175878, at *6, and thus fall within the judicially created [*1356] "mathematical algorithm" exception to statutory subject matter.

n1 "Process" is defined in 35 U.S.C. § 100(b) to encompass: "[a] process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material."

[**10]

A mathematical formula alone, sometimes referred to as a mathematical algorithm, viewed in the abstract, is considered unpatentable subject matter. See *Diamond v. Diehr*, 450 U.S. 175, 67 L. Ed. 2d 155, 101 S. Ct. 1048 (1981); *Parker v. Flook*, 437 U.S. 584, 57 L. Ed. 2d 451, 98 S. Ct. 2522 (1978); *Gottschalk v. Benson*, 409 U.S. 63, 34 L. Ed. 2d 273, 93 S. Ct. 253 (1972). Courts have used the terms "mathematical algorithm," "mathematical formula," and "mathematical equation," to describe types of nonstatutory mathematical subject matter without explaining whether the terms are interchangeable or different. Even assuming the words connote the same concept, there is considerable question as to exactly what the concept encompasses. See, e.g., *Diehr*, 450 U.S. at 186 n.9 ("The term 'algorithm' is subject to a variety of definitions . . . [Petitioner's] definition is significantly broader than the definition this Court employed in *Benson* and *Flook*."); accord *In re Schrader*, 22 F.3d 290, 293 n.5, 30 U.S.P.Q.2D (BNA) 1455, 1457 n.5 (Fed. Cir. 1994).

This court recently pointed out that any step-by-step process, be it electronic, chemical, or mechanical, involves an [*11] "algorithm" in the broad sense of the term. See *State Street Bank & Trust Co. v. Signature Fin. Group, Inc.*, 149 F.3d 1368, 1374-75, 47 U.S.P.Q.2D (BNA) 1596, 1602 (Fed. Cir. 1998), cert. denied, U.S. , 142 L. Ed. 2d 704, 119 S. Ct. 851 (1999). Because § 101 includes processes as a category of patentable subject matter, the judicially-defined proscription against patenting of a "mathematical algorithm," to the extent such a proscription still exists, is narrowly limited to mathematical algorithms in the abstract. See *id.*; see also *Benson*, 409 U.S. at 65 (describing a mathematical algorithm as a "procedure for solving a given type of mathematical problem").

Since the process of manipulation of numbers is a fundamental part of computer technology, we have had to reexamine the rules that govern the patentability of such technology. The sea-changes in both law and technology stand as a testament to the ability of law to adapt to new and innovative concepts, while remaining true to basic principles. In an earlier era, the PTO published guidelines essentially rejecting the notion that computer programs were patentable. n2 As the technology progressed, our predecessor [*12] court disagreed, and, overturning some of the earlier limiting principles regarding § 101, announced more expansive principles

formulated with computer technology in mind.ⁿ³ In our recent decision in *State Street*, this court discarded the so-called "business method" exception and reassessed the "mathematical algorithm" exception, see *149 F.3d at 1373-77*, *47 U.S.P.Q.2D (BNA) at 1600-04*, both judicially-created "exceptions" to the statutory categories of § 101. As this brief review suggests, this court (and its predecessor) has struggled to make our understanding of the scope of § 101 responsive to the needs of the modern world.

ⁿ² See, e.g., *33 Fed. Reg. 15581, 15609-10 (1968)*.

ⁿ³ See *In re Tarczy-Hornoch*, *55 C.C.P.A. 1441*, *397 F.2d 856*, *158 U.S.P.Q. (BNA) 141 (CCPA 1968)* (overruling the "function of a machine" doctrine); see also *In re Bernhart*, *57 C.C.P.A. 737*, *417 F.2d 1395*, *163 U.S.P.Q. (BNA) 611 (CCPA 1969)* (discussing patentability of a programmed computer); *In re Musgrave*, *57 C.C.P.A. 1352*, *431 F.2d 882*, *167 U.S.P.Q. (BNA) 280 (CCPA 1970)* (analyzing process claims encompassing computer programs). For a more detailed review of this history, with extensive citation to the secondary literature, see Justice Stevens's dissent in *Diehr*, *450 U.S. at 193*.

[**13]

The Supreme Court has supported and enhanced this effort. In *Diehr*, the Court expressly limited its two earlier decisions in *Flook* and *Benson* by emphasizing that these cases did no more than confirm the "long-established principle" that laws of nature, natural phenomena, and abstract ideas are excluded from patent protection. *450 U.S. at 185*. The *Diehr* [*1357] Court explicitly distinguished *Diehr*'s process by pointing out that "the respondents here do not seek to patent a mathematical formula. Instead, they seek patent protection for a process of curing synthetic rubber." *Id. at 187*. The Court then explained that although the process used a well-known mathematical equation, the applicants did not "pre-empt the use of that equation." *Id.* Thus, even though a mathematical algorithm is not patentable in isolation, a process that applies an equation to a new and useful end "is at the very least not barred at the threshold by § 101." *Id. at 188*. In this regard, it is particularly worthy of note that the argument for the opposite result, that "the term 'algorithm' . . . is synonymous with the term 'computer program,'" *id. at 219* (Stevens, J., dissenting), and thus [**14] computer-based programs as a general proposition should not be patentable, was made forcefully in dissent by Justice Stevens; his view, however, was rejected by the *Diehr* majority.

As previously noted, we most recently addressed the "mathematical algorithm" exception in *State Street*. See *149 F.3d at 1373-75*, *47 U.S.P.Q.2D (BNA) at 1600-02*. In *State Street*, this court, following the Supreme Court's guidance in *Diehr*, concluded that "unpatentable mathematical algorithms are identifiable by showing they are merely abstract ideas constituting disembodied concepts or truths that are not 'useful.' . . . To be patentable an algorithm must be applied in a 'useful' way." *Id. at 1373*, *47 U.S.P.Q.2D (BNA) at 1601*. In that case, the claimed data processing system for implementing a financial management structure satisfied the § 101 inquiry because it constituted a "practical application of a mathematical algorithm, . . . [by] producing 'a useful, concrete and tangible result.'" *Id. at 1373*, *47 U.S.P.Q.2D (BNA) at 1601*.

The *State Street* formulation, that a mathematical algorithm may be an integral part of patentable subject matter such as a machine or process if the claimed invention as [**15] a whole is applied in a "useful" manner, follows the approach taken by this court en banc in *In re Alappat*, *33 F.3d 1526*, *31 U.S.P.Q.2D (BNA) 1545 (Fed. Cir. 1994)*. In *Alappat*, we set out our understanding of the Supreme Court's limitations on the patentability of mathematical subject matter and concluded that:

[The Court] never intended to create an overly broad, fourth category of [mathematical] subject matter excluded from § 101. Rather, at the core of the Court's analysis . . . lies an attempt by the Court to explain a rather straightforward concept, namely, that certain types of mathematical subject matter, standing alone, represent nothing more than abstract ideas until reduced to some type of practical application, and thus that subject matter is not, in and of itself, entitled to patent protection.

Id. at 1543, *31 U.S.P.Q.2D (BNA) at 1556-57* (emphasis added). Thus, the *Alappat* inquiry simply requires an examination of the contested claims to see if the claimed subject matter as a whole is a disembodied mathematical concept representing nothing more than a "law of nature" or an "abstract idea," or if the mathematical concept has been reduced to some [**16] practical application rendering it "useful." *Id. at 1544*, *31 U.S.P.Q.2D (BNA) at 1557*. In *Alappat*, we held that more than an abstract idea was claimed because the claimed invention as a whole was directed toward forming a specific machine that produced the useful, concrete, and tangible result of a

smooth waveform display. See *id.* at 1544, 31 U.S.P.Q.2D (BNA) at 1557.

In both *Alappat* and *State Street*, the claim was for a machine that achieved certain results. In the case before us, because Excel does not own or operate the facilities over which its calls are placed, AT&T did not charge Excel with infringement of its apparatus claims, but limited its infringement charge to the specified method or process claims. Whether stated implicitly or explicitly, we consider the scope of § 101 to be the same regardless of the form - machine or process - in which a particular claim is drafted. See, e.g., In [*1358] *re Alappat*, 33 F.3d at 1581, 31 U.S.P.Q.2D (BNA) at 1589 (Rader, J., concurring) ("Judge Rich, with whom I fully concur, reads *Alappat*'s application as claiming a machine. In fact, whether the invention is a process or a machine is irrelevant. The language of the Patent Act itself, as well as [*17] Supreme Court rulings, clarifies that *Alappat*'s invention fits comfortably within 35 U.S.C. § 101 whether viewed as a process or a machine."); *State Street*, 149 F.3d at 1372, 47 U.S.P.Q.2D (BNA) at 1600 ("For the purposes of a § 101 analysis, it is of little relevance whether claim 1 is directed to a 'machine' or a 'process,' . . ."). Furthermore, the Supreme Court's decisions in *Diehr*, *Benson*, and *Flook*, all of which involved method (i.e., process) claims, have provided and supported the principles which we apply to both machine- and process-type claims. Thus, we are comfortable in applying our reasoning in *Alappat* and *State Street* to the method claims at issue in this case.

C.

In light of this review of the current understanding of the "mathematical algorithm" exception, we turn now to the arguments of the parties in support of and in opposition to the trial court's judgment. We note that, at the time the trial court made its decision, that court did not have the benefit of this court's explication in *State Street* of the mathematical algorithm issue.

As previously explained, AT&T's claimed process employs subscribers' and call recipients' PICs as data, applies [*18] Boolean algebra to those data to determine the value of the PIC indicator, and applies that value through switching and recording mechanisms to create a signal useful for billing purposes. In *State Street*, we held that the processing system there was patentable subject matter because the system takes data representing discrete dollar amounts through a series of mathematical calculations to determine a final share price - a useful, concrete, and tangible result. See 149 F.3d at 1373, 47 U.S.P.Q.2D (BNA) at 1601.

In this case, Excel argues, correctly, that the PIC indicator value is derived using a simple mathematical principle (p and q). But that is not determinative because

AT&T does not claim the Boolean principle as such or attempt to forestall its use in any other application. It is clear from the written description of the '184 patent that AT&T is only claiming a process that uses the Boolean principle in order to determine the value of the PIC indicator. The PIC indicator represents information about the call recipient's PIC, a useful, non-abstract result that facilitates differential billing of long-distance calls made by an IXC's subscriber. Because the claimed process applies [*19] the Boolean principle to produce a useful, concrete, tangible result without pre-empting other uses of the mathematical principle, on its face the claimed process comfortably falls within the scope of § 101. See *Arrhythmia Research Tech. Inc. v. Corazonix Corp.*, 958 F.2d 1053, 1060, 22 U.S.P.Q.2D (BNA) 1033, 1039 (Fed. Cir. 1992) ("That the product is numerical is not a criterion of whether the claim is directed to statutory subject matter.").

Excel argues that method claims containing mathematical algorithms are patentable subject matter only if there is a "physical transformation" or conversion of subject matter from one state into another. The physical transformation language appears in *Diehr*, see 450 U.S. at 184 ("That respondents' claims involve the transformation of an article, in this case raw, uncured synthetic rubber, into a different state or thing cannot be disputed."), and has been echoed by this court in *Schrader*, 22 F.3d at 294, 30 U.S.P.Q.2D (BNA) at 1458 ("Therefore, we do not find in the claim any kind of data transformation.").

The notion of "physical transformation" can be misunderstood. In the first place, it is not an invariable requirement, but merely one example [*20] of how a mathematical algorithm may bring about a useful application. As the Supreme Court itself noted, [*1359] "when [a claimed invention] is performing a function which the patent laws were designed to protect (e.g., transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101." *Diehr*, 450 U.S. at 192 (emphasis added). The "e.g." signal denotes an example, not an exclusive requirement.

This understanding of transformation is consistent with our earlier decision in *Arrhythmia*, 958 F.2d 1053, 22 U.S.P.Q.2D (BNA) 1033 (Fed. Cir. 1992). *Arrhythmia*'s process claims included various mathematical formulae to analyze electrocardiograph signals to determine a specified heart activity. See *id.* at 1059, 22 U.S.P.Q.2D (BNA) at 1037-38. The *Arrhythmia* court reasoned that the method claims qualified as statutory subject matter by noting that the steps transformed physical, electrical signals from one form into another form - a number representing a signal related to the patient's heart activity, a non-abstract output. See *id.*, 22 U.S.P.Q.2D (BNA) at

1038. The finding that the claimed process "transformed" data from one "form" to another simply [**21] confirmed that Arrhythmia's method claims satisfied § 101 because the mathematical algorithm included within the process was applied to produce a number which had specific meaning - a useful, concrete, tangible result - not a mathematical abstraction. See *id.* at 1060, 22 U.S.P.Q.2D (BNA) at 1039.

Excel also contends that because the process claims at issue lack physical limitations set forth in the patent, the claims are not patentable subject matter. This argument reflects a misunderstanding of our case law. The cases cited by Excel for this proposition involved machine claims written in means-plus-function language. See, e.g., *State Street*, 149 F.3d at 1371, 47 U.S.P.Q.2D (BNA) at 1599; *Alappat*, 33 F.3d at 1541, 31 U.S.P.Q.2D (BNA) at 1554-55. Apparatus claims written in this manner require supporting structure in the written description that corresponds to the claimed "means" elements. See 35 U.S.C. § 112, para. 6 (1994). Since the claims at issue in this case are directed to a process in the first instance, a structural inquiry is unnecessary.

The argument that physical limitations are necessary may also stem from the second part of the Freeman-Walter-Abele test, n4 an earlier [**22] test which has been used to identify claims thought to involve unpatentable mathematical algorithms. That second part was said to inquire "whether the claim is directed to a mathematical algorithm that is not applied to or limited by physical elements." *Arrhythmia*, 958 F.2d at 1058, 22 U.S.P.Q.2D (BNA) at 1037. Although our en banc Alappat decision called this test "not an improper analysis," we then pointed out that "the ultimate issue always has been whether the claim as a whole is drawn to statutory subject matter." 33 F.3d at 1543 n.21, 31 U.S.P.Q.2D (BNA) at 1557 n.21. Furthermore, our recent *State Street* decision questioned the continuing viability of the Freeman-Walter-Abele test, noting that, "after *Diehr* and *Chakrabarty*, the Freeman-Walter-Abele test has little, if any, applicability to determining the presence of statutory subject matter." 149 F.3d at 1374, 47 U.S.P.Q.2D (BNA) at 1601. Whatever may be left of the earlier test, if anything, this type of physical limitations analysis seems of little value because "after *Diehr* and *Alappat*, the mere fact that a claimed invention involves inputting numbers, calculating numbers, outputting numbers, and storing [**23] numbers, in and of itself, would not render it nonstatutory subject matter, unless, of course, its operation does not produce a 'useful, concrete and tangible result.'" *Id.* at 1374, 47 U.S.P.Q.2D (BNA) at 1602 (quoting *Alappat*, 33 F.3d at 1544, 31 U.S.P.Q.2D (BNA) at 1557).

n4 See *In re Freeman*, 573 F.2d 1237, 197 U.S.P.Q. (BNA) 464 (CCPA 1978), as modified by *In re Walter*, 618 F.2d 758, 205 U.S.P.Q. (BNA) 397 (CCPA 1980), and *In re Abele*, 684 F.2d 902, 214 U.S.P.Q. (BNA) 682 (CCPA 1982).

Because we focus on the inquiry deemed "the ultimate issue" by Alappat, rather than on the physical limitations inquiry of [*1360] the Freeman-Walter-Abele test, we find the cases cited by Excel in support of its position to be inapposite. For example, in *In re Grams*, the court applied the Freeman-Walter-Abele test and concluded that the only physical step in the claimed process involved data-gathering for the algorithm; thus, the claims were held to be directed to unpatentable subject matter. See 888 F.2d 835, 839, 12 U.S.P.Q.2D (BNA) 1824, [**24] 1829 (Fed. Cir. 1989). In contrast, our inquiry here focuses on whether the mathematical algorithm is applied in a practical manner to produce a useful result. *In re Grams* is unhelpful because the panel in that case did not ascertain if the end result of the claimed process was useful, concrete, and tangible.

Similarly, the court in *In re Schrader* relied upon the Freeman-Walter-Abele test for its analysis of the method claim involved. The court found neither a physical transformation nor any physical step in the claimed process aside from the entering of data into a record. See 22 F.3d at 294, 30 U.S.P.Q.2D (BNA) at 1458. The Schrader court likened the data-recording step to that of data-gathering and held that the claim was properly rejected as failing to define patentable subject matter. See *id.* at 294, 296, 30 U.S.P.Q.2D (BNA) at 1458-59. The focus of the court in *Schrader* was not on whether the mathematical algorithm was applied in a practical manner since it ended its inquiry before looking to see if a useful, concrete, tangible result ensued. Thus, in light of our recent understanding of the issue, the Schrader court's analysis is as unhelpful as that of [**25] *In re Grams*.

Finally, the decision in *In re Warmerdam*, 33 F.3d 1354, 31 U.S.P.Q.2D (BNA) 1754 (Fed. Cir. 1994) is not to the contrary. There the court recognized the difficulty in knowing exactly what a mathematical algorithm is, "which makes rather dicey the determination of whether the claim as a whole is no more than that." *Id.* at 1359, 31 U.S.P.Q.2D (BNA) at 1758. Warmerdam's claims 1-4 encompassed a method for controlling the motion of objects and machines to avoid collision with other moving or fixed objects by generating bubble hierarchies through the use of a particular mathematical procedure. See *id.* at 1356, 31 U.S.P.Q.2D (BNA) at 1755-56. The court found that the claimed process did nothing more than manipulate basic mathematical constructs and concluded that "taking several abstract ideas and manipulating them together adds nothing to the basic equation"; hence, the

court held that the claims were properly rejected under § 101. *Id.* at 1360, 31 U.S.P.Q.2D (BNA) at 1759. Whether one agrees with the court's conclusion on the facts, the holding of the case is a straightforward application of the basic principle that mere laws of nature, natural phenomena, and abstract ideas are not within the [**26] categories of inventions or discoveries that may be patented under § 101.

D.

In his dissent in *Diehr*, Justice Stevens noted two concerns regarding the § 101 issue, and to which, in his view, federal judges have a duty to respond:

First, the cases considering the patentability of program-related inventions do not establish rules that enable a conscientious patent lawyer to determine with a fair degree of accuracy which, if any, program-related inventions will be patentable. Second, the inclusion of the ambiguous concept of an "algorithm" within the "law of nature" category of unpatentable subject matter has given rise to the concern that almost any process might be so described and therefore held unpatentable.

Diehr, 450 U.S. at 219 (Stevens, J., dissenting).

Despite the almost twenty years since Justice Stevens wrote, these concerns remain important. His solution was to declare all computer-based programming unpatentable. That has not been the course the law has taken. Rather, it is now clear that computer-based programming constitutes patentable subject matter so long as the basic requirements of § 101 are met. Justice Stevens's concerns can be addressed [**27] within that framework.

[*1361] His first concern, that the rules are not sufficiently clear to enable reasonable prediction of outcomes, should be less of a concern today in light of the refocusing of the § 101 issue that *Alappat* and *State Street* have provided. His second concern, that the ambiguous concept of "algorithm" could be used to make any process unpatentable, can be laid to rest once the focus is understood to be not on whether there is a mathematical algorithm at work, but on whether the algorithm-containing invention, as a whole, produces a tangible, useful, result.

In light of the above, and consistent with the clearer understanding that our more recent cases have provided, we conclude that the district court did not apply the proper analysis to the method claims at issue. Furthermore, had the court applied the proper analysis to the stated claims, the court would have concluded that all the claims asserted fall comfortably within the broad scope of patentable subject matter under § 101. Accordingly, we hold as a matter of law that *Excel* was not entitled to the grant of summary judgment of invalidity of the '184 patent under § 101.

Since the case must be returned [**28] to the trial court for further proceedings, and to avoid any possible misunderstandings as to the scope of our decision, we note that the ultimate validity of these claims depends upon their satisfying the other requirements for patentability such as those set forth in 35 U.S.C. § § 102, 103, and 112. Thus, on remand, those questions, as well as any others the parties may properly raise, remain for disposition.

CONCLUSION

The district court's summary judgment of invalidity is reversed, and the case is remanded for further proceedings consistent with this opinion.

REVERSED & REMANDED.